the OIL AND GAS
JOURNAL
MARCH 17, 1958

★★★★
U. S.
POOL MAPS
of
17 Selected
Areas
p. 105

Reserves study shows:

CRUDE DOWN, GAS UP p. 80

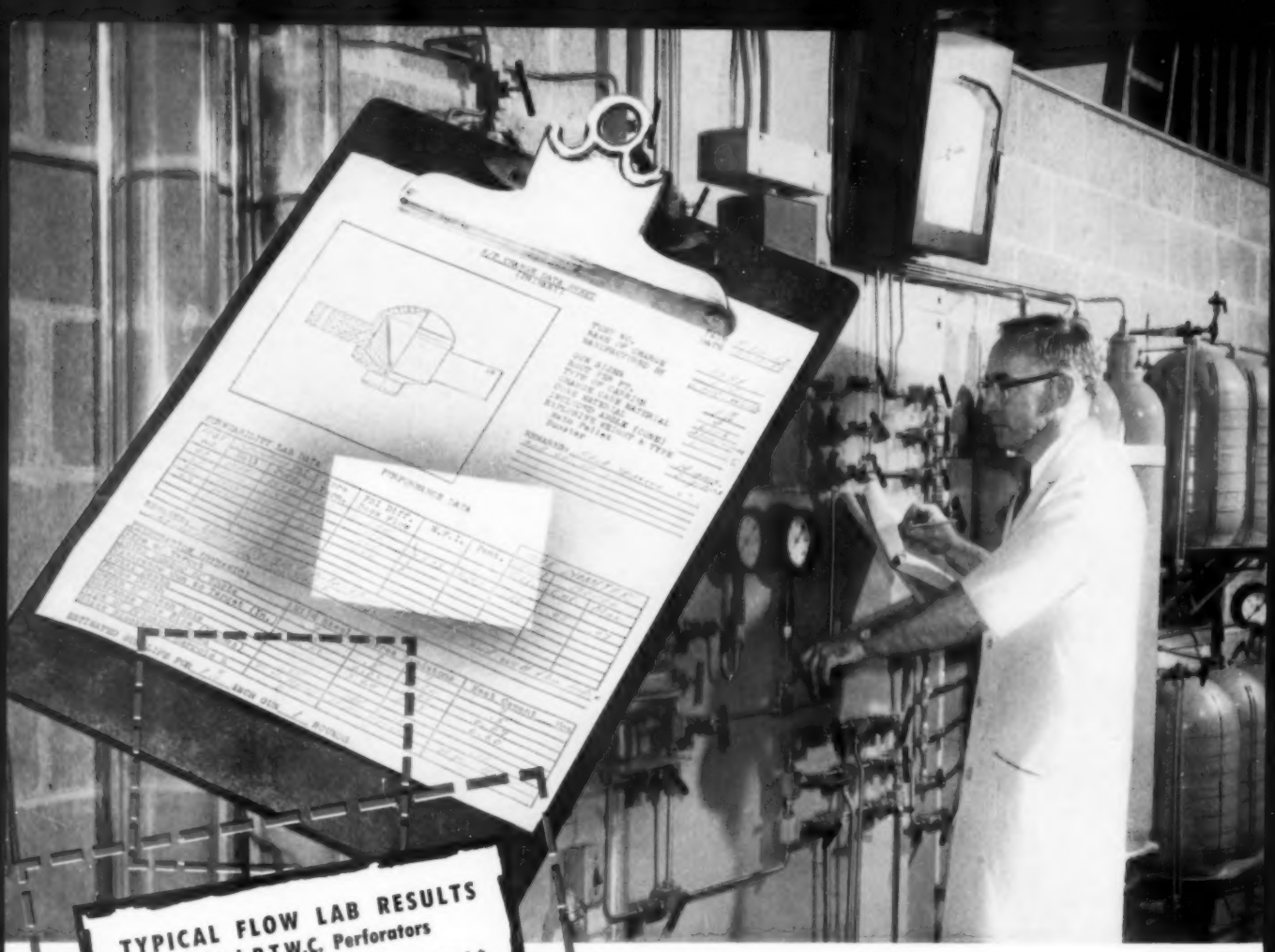
California Feeling Pinch of Oversupply p. 86

SPECIAL

Exploration

NUMBER

p. 103



TYPICAL FLOW LAB RESULTS
Selected P.T.W.C. Perforators

Perforators	Average W.F.I.*
1 11/16 Bearcat	1.13
2 3/16 Bearcat	1.06
1 11/16 Swing Jet	.96
1 11/16 Competitor A	.92

*Well Flow Index is the ratio of the flow through the perforated core to the flow through the same core prior to perforating.

Documented
PERFORATING PERFORMANCE

FROM THE LABORATORIES OF LANE-WELLS COMES A NEW MEASURE OF PERFORATING EFFECTIVENESS

For more than a year Lane-Wells Flow Laboratory engineers have been testing perforators under pressure and temperature conditions duplicating those found underground . . . accumulating data to help you evaluate perforating. Perforations made under various formation-to-hole pressure differentials in formation samples and the subsequent flow rates provide an index of perforating effectiveness. This WFI (well flow index), together with other accepted perforating performance values, gives you more information than has ever been available before. Ask your Lane-Wells man about this newest Lane-Wells research contribution in the interest of improved petroleum production.

LANE-WELLS COMPANY

P. O. BOX 1664, HOUSTON 1, TEXAS

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
March 17, 1958

Imports issue is one of hottest in Washington.

Tug-of-war developing around White House features:

...Congressmen and domestic producers trying to persuade the President to use his authority to invoke mandatory controls over oil imports.

...Cabinet fuels committee still holding out for voluntary controls, but probably with teeth in them.

Insiders insist odds still favor the voluntary approach. But advocates of forceful action threaten to write compulsory controls into the trade law if President doesn't act.

This could open the door to scores of other protection moves (p. 77).

Counter move is being planned by U. S. business men in Caracas against curbs on Venezuelan oil shipments to U. S.

Americans there see imports controls as a blow to trade in other commodities.

Behind the plan is the American Chamber of Commerce in Venezuela whose membership does not include oil companies. Group wants to raise $100,000 per year from its members to defend Venezuelan trade with U. S.

Offices may be opened soon in Washington and other key U. S. cities to attack import curbs.

It's a good bet that export of gas from Canada to U. S. will get approval of Borden Energy Commission. The emphasis will be on better assurances of fair prices for Canadian producers.

Commission is now in recess, digesting findings of its hearings in Calgary. It will resume April 8 in Toronto and has further meetings set for Regina, Vancouver, Winnipeg, and Calgary. Final report is not expected now until summer.

Union labor has lost another round with drilling men.

Rig crewmen of A. W. Thompson, Inc., Houston, voted 90-42 against operating-engineers union as their bargaining agent. That's biggest drilling contractor yet tackled in the Permian basin by union organizers.

Balloting in the NLRB-supervised election was conducted at Lovington, N. M., Odessa, Tex., and at company rigs scattered throughout West Texas and New Mexico.

That West Texas gas line is still being talked.

Reports link several big gas producers with plans for joint effort to build the big-inch intrastate line to serve industrial markets in Dallas-Fort Worth area.

The plan: A 24-in. line from upper Texas Panhandle to West Texas. There it will link with 36-in. line extending to Dallas-Fort Worth. Reserves are available since sales would not come under federal control.

Involved are: Phillips Petroleum, Pan American, Delhi-Taylor. Also Humble may make some of its gas available if the line is built.

Ray C. Fish, builder of Pacific Northwest, has declined comment on reports he is active in promoting the new venture.

The Peoples-Midwestern gas deal may get scrutiny from a federal grand jury.

Justice Department has refused to give the companies advance antitrust immunity on their informal agreement.

Under the deal Peoples Gas withdrew its opposition to proposal by Midwestern for Tennessee-to-Canada gas line. Both then sought Justice Department clearance. But Justice Department refused because present grand jury investigation already involves the battle over Midwest gas markets.

Geophysical prospecting slumped in the oil industry last year to a new low level for recent years.

Seismic operations dropped 8 per cent. An average of 522 seismic crews operated in U. S. during year compared with 568 crews the year before (p. 176).

Gravity crew operations also dropped--from an average of 82 in 1956 to 72 last year.

Magnetic survey work only increased from 45 crew-months to 76 crew-months in 1957.

One fact to remember: In the last 14 years percentage of new-field wildcats located by technical advice has risen from 77 to 82 (p. 132).

Look for Gulf Oil to drill a wildcat off the coast of Florida later this year.

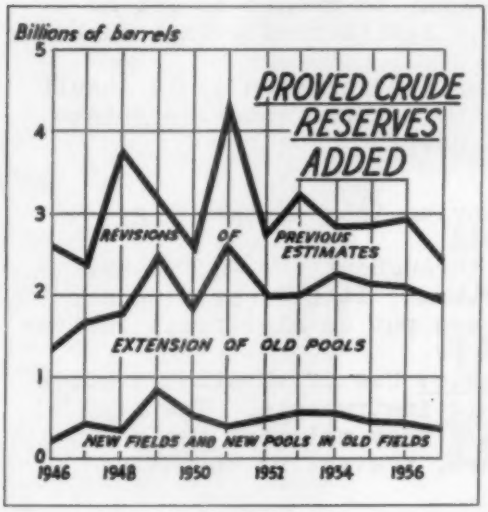
The test probably will be drilled off the southwest tip of the peninsula. Gulf and Commonwealth Oil jointly hold a large block offshore there.

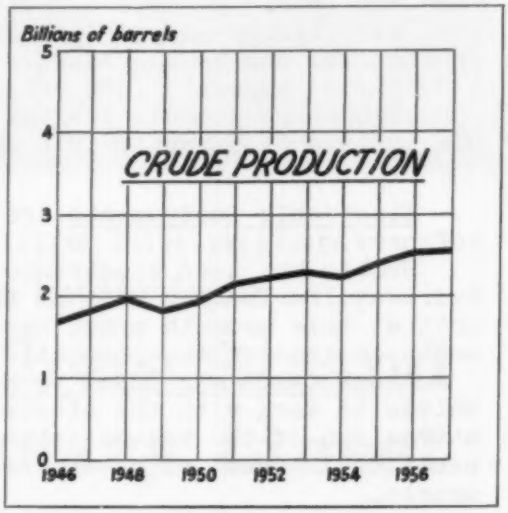
Use of additives in crude by producers is causing a few headaches for refiners.

Crude streams reaching their plants with unknown and undesirable compounds foul up processing schemes.

An example: Chlorinated solvents used in cutting paraffins. These pass through distillation units, then are charged along with light naphthas to cat reforming units. There they tend to foul up the noble metal catalysts.

What makes the problem worse is this: The additives are





Why our crude reserves are declining is shown above.

For 1957, note that proved crude reserves added dropped below crude production for first time in postwar era. Also production moved to a new peak. Result, according to the API, is less oil in the ground at the end of the year.

Analyze the reserves added. You'll find:

...Discoveries of new fields and new pools slipped slightly and are a small factor in adding reserves.

...Development by extending old pools adds the bulk of reserves—and always has.

...Revisions of previous estimates became less a factor in 1957.

The whole story: Gas liquids followed crude down but natural-gas reserves climbed (p. 80).

---

introduced at infrequent intervals. They arrive at refinery in slugs. Thus the refiner doesn't know what to expect.

Proper blend of motor oil in today's cars can save as much as six octane numbers in gasoline.

Indiana Standard researchers in report to SAE say they have found which components of lube oils are the bad actors forming engine deposits. These deposits in turn boost the octane needs of new cars.

Some additives are good, some bad, the report said. Phosphorus additives offer the most economical and effective route to saving octanes.

More cracked distillate will be used to fuel high-speed diesel engines in the future.

That's prediction of G. C. Wilson of Ethyl's Detroit research labs. He says additives may be needed to act as fuel stabilizers and to accelerate ignition so cetane number of the fuel can be increased.

Wilson suggested more efficient performance would result for high-speed diesels if fuel were metered into the intake air instead of directly into cylinders.

Electronic instruments are moving into another big refinery.

Humble has used electronics throughout new 40,000-bbl. Hydrodesulfurization unit at Baytown. It's first time any unit at this mammoth plant has been put on electronic instruments instead of the pneumatic type.

A new twist was added by Humble: Use of electrohydraulic valves to work with the electronic instruments. The big attraction of the valves is this: They maintain their position in event of power failure, preventing operating upsets.

Tanker lay-ups are continuing. About 250 ships, or 10 per cent of the world total, are currently idle.

Practically all lay-ups are ships of World War II vintage. But some idled are recently built supertankers. These include the 45,833-ton Veedol of Tidewater, Hemisphere Trading's 53,085-ton George F. Getty, Pan Oceanic's 32,000-ton Atlantic Conqueror, and Petromer's 32,256-ton Golden Eagle.

The tanker trade is suffering from low rates, less hauling business, and a resulting oversupply of ships. Even the most modern tankers have trouble showing profits. The older vessels are having even more trouble.

More company profit reports are in for 1957:

	Profits 1957	Profits 1956	Per share income 1957	Per share income 1956	Per cent change in net profits
	(thousand $)				
Humble Oil & Refining ...	175,900	179,000	2.45	2.49	Down 1.7
McRae Oil & Gas	315	192	0.12	0.10	UP 64.1
Phillips Petroleum	96,200	95,200	....	2.77	UP 1.1
Pure Oil	35,524	36,560	4.13	4.26	Down 2.8
Sinclair Oil	80,000	91,100	5.20	6.17	Down 12.2
Skelly Oil	36,784	34,093	6.40	5.93	UP 7.9
Standard of Cal.	288,230	267,890	4.56	4.24	UP 7.6
Standard (Ind.)	151,509	149,431	4.27	4.33	UP 1.4
Standard (Ky.)	12,626	12,478	4.85	4.79	UP 1.2
Texas Gulf Producing	6,442	5,658	1.60	1.40	UP 13.9

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the OIL AND GAS JOURNAL

MARCH 17, 1958 • VOLUME 56 • NUMBER 11

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The Oil and Gas Journal, published Mondays, copyright 1958, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

IN THE NEWS

General Interest:

Odds Still Favor Voluntary Imports-Control Plan ... 77
Texas Import Study Group Will Resume Hearings ... 78
Crude and Gas-Liquids Reserves Fall, Gas Reserves Up ... 80
Federal Jury Takes Testimony of Top Industry Officials ... 83
Survey Shows Motorists Getting More for Gasoline Dollar ... 85
California Producers and Refiners Hurt by Oversupply ... 86

Processing:

Unique Adsorption Tool Brings Efficiency, Economy ... 83
Processing Briefs ... 84
Phillips Negotiates for Union Contract at Borger Plant ... 93
FTC Say Re-refined Lube Oils Must Be Identified ... 94

Exploration:

Average Wildcat Finds Less Oil at Much Greater Cost ... 84
Gas Strikes in Alberta Foothills Mean More Drilling ... 90
An Editor and a Professor Discuss Teaching Methods ... 227
Drilling Statistics on Western Canada for 1957 ... 232
New Exploration on Upper Texas Coast Gets Results ... 235
Big Lease Play Under Way in Palo Pinto County, Texas ... 240
Pine Replaces Poplar as Montana's Biggest Producer ... 244
Oklahoma Drilling Rebounds Despite Cutback Elsewhere ... 245

Production:

Production Cutbacks Are Hurting Alberta's Budget ... 93
Water Blamed for Allowable Cut in Big New Mexico Field ... 94
Alabama Oil Men Have Sold the State on Conservation ... 96

Pipelining:

Four Corners Installs Microwave Network ... 79
Pipeline Firms Claim U. S. Repudiating Consent Decrees ... 88
Pipeline Briefs ... 88
Justice Department Refuses to Clear Midwestern Gas Plan ... 93
CIG Offers $24-Million Refund in Move to End Rate Fight ... 94

International:

Oil Has a Big Stake in Fighting on Sumatra ... 98
New Block 4 Well in Maracaibo Has 5,138-Bbl. Flow ... 99
Venezuela Names New Petroleum Attache in Washington ... 100
French Plan Confirmation Test of Paris Basin Discovery ... 101
Iran Opposes Pact Between Saudi Arabia and Bahrain ... 101
Inland Refining Area Is Developing in France ... 102

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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SPECIAL EXPLORATION SECTION

Oil and Gas Fields of the United States 103

Here is a 16-page section in color showing the location of the principal oil and gas fields of the U.S. These are working maps and will be of value to every oil man.

Color Aerial Photographs—New Oil-Finding Tool 122

This is a new approach to oil finding that gives more information than conventional black-and-white aerial photos.

Deep Pay Zones Lure Oklahoma Operators . . 126

By Fred P. Schweers

In southern Oklahoma the best hope for new production lies in the deeper Ordovician reservoirs. The author gives a resume of the structural geology of this complex area.

Wildcat Drilling Down 10% in 1957 132

By Dr. B. W. Blanpied

Here is the annual report of the AAPG Committee on Statistics of exploratory drilling. Average wildcat depth for 1957 was 4,701 ft., 127 ft. deeper than in the previous year.

Seismograph Can Map Strat Traps 144

By Gerald H. Westby

New tools and techniques now permit the geophysicist to map the illusive strat trap, and the author outlines how this can be done.

Gravity Surveys Can Be a Potent Oil-Finding Tool 159

By Jonathan W. Phillips

Gravity surveys are invaluable for pinpointing areas of interest in oil exploration. These can be evaluated with the seismograph or by drilling at a later date.

Domestic Seismic Activity Slumps in 1957 . . 176

By Homer G. Patrick

A summary of geophysical activity in the United States and Canada during 1957. This report is by the Society of Exploration Geophysicists' Committee on Geophysical Activity.

TECHNOLOGY—OPERATION

The Foreman's Page 179

New Sea-Going Pipe Layer 180

By Larry Resen

Here is a decription of the latest addition to a growing fleet sparked by an upswing in off-shore pipelining.

On The Job . . . In the Fields 183

Pulsation dampeners can tame pressure surges in production operations—Plastic flakes can solve tank leakage.

Modern Drilling 189

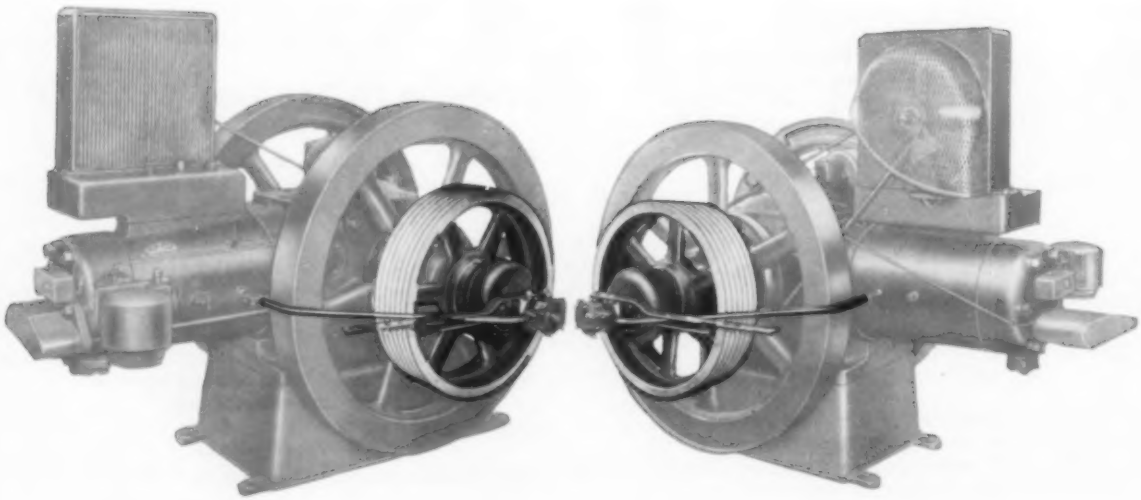
Process Costimating 190

Pipeline Construction Report 194

DEPARTMENTS

They Say	56	Costimating	190	Deaths in the Industry	257
Calendar of Events	63	Drilling Contractors	192	Statistical Summary	258
Journally Speaking	73	Pipeline Construction Report	194	Drilling Statistics	259
Editorial	75	New Equipment	202	Supply Statistics	260
International News	98	Trade Literature	214	Refining Statistics	261
Foreman's Page	179	Equipment Men in News	220	Markets	262
On the Job . . . Fields	183	Exploration Highlights	227	Classified Advertising	263
Modern Drilling	189	Personals	254	Advertisers' Index	267

Here...or here...



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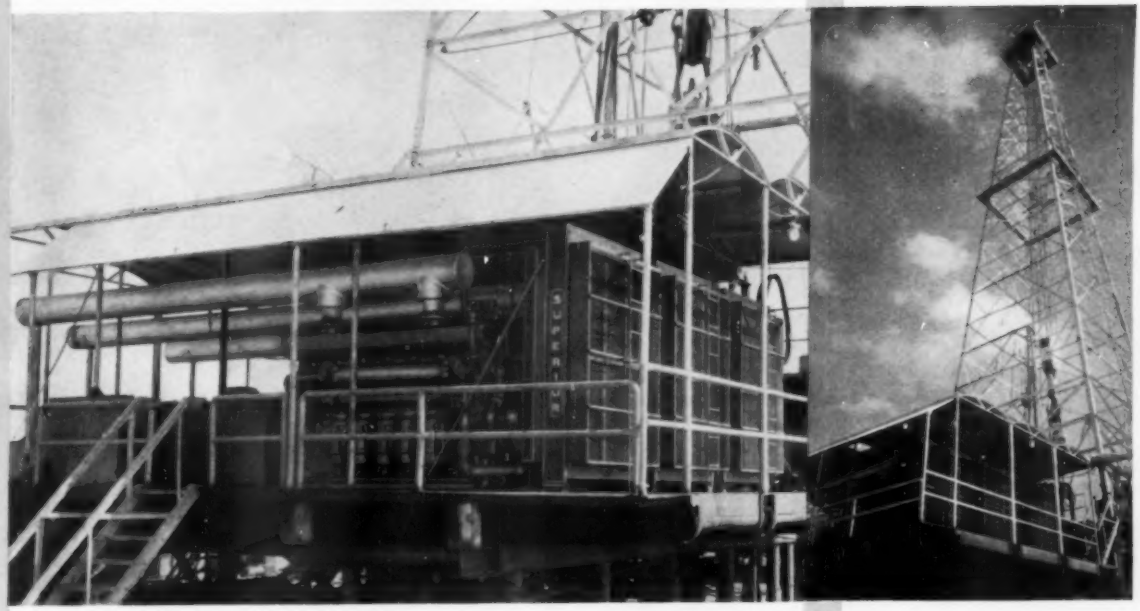

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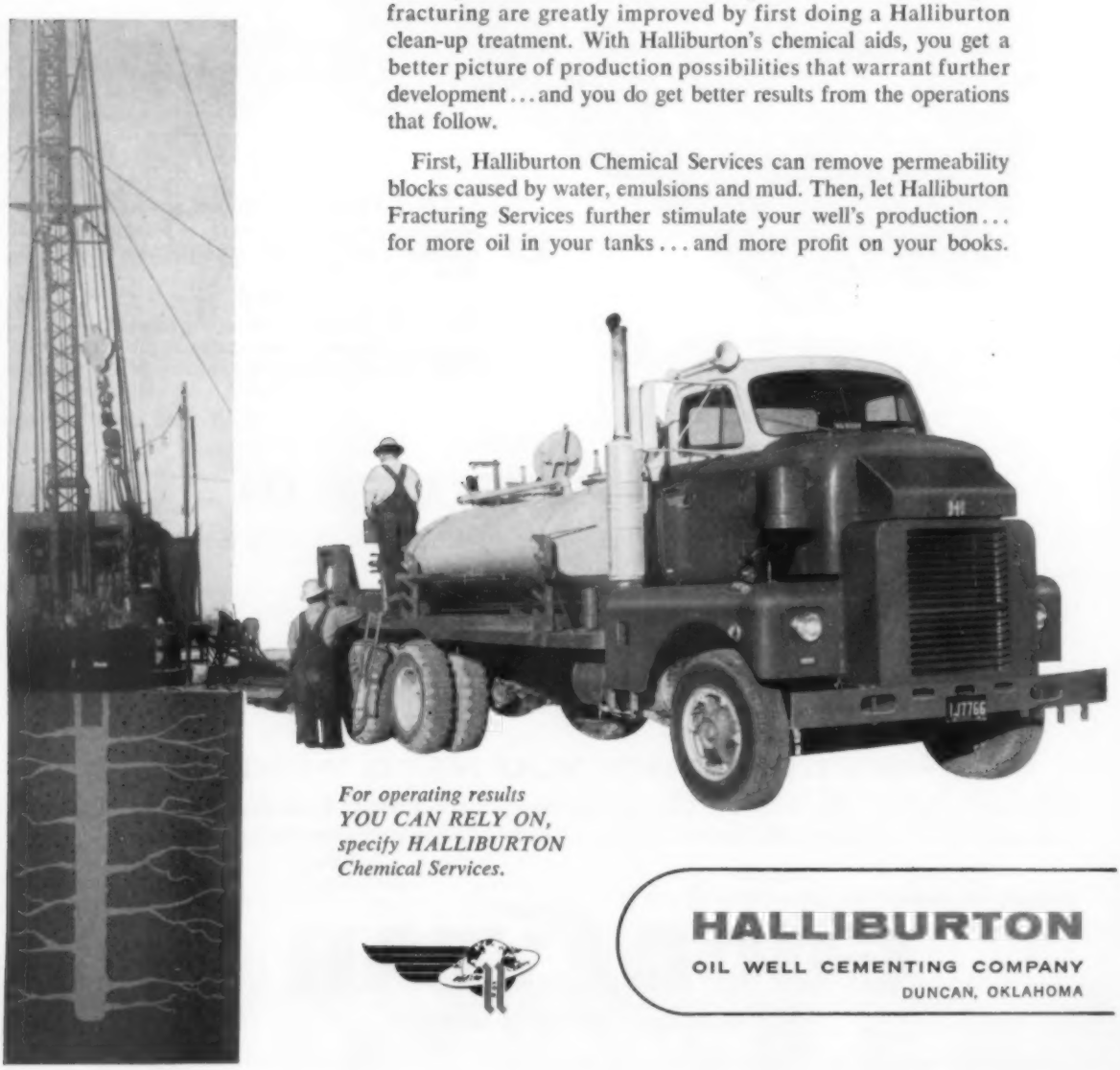

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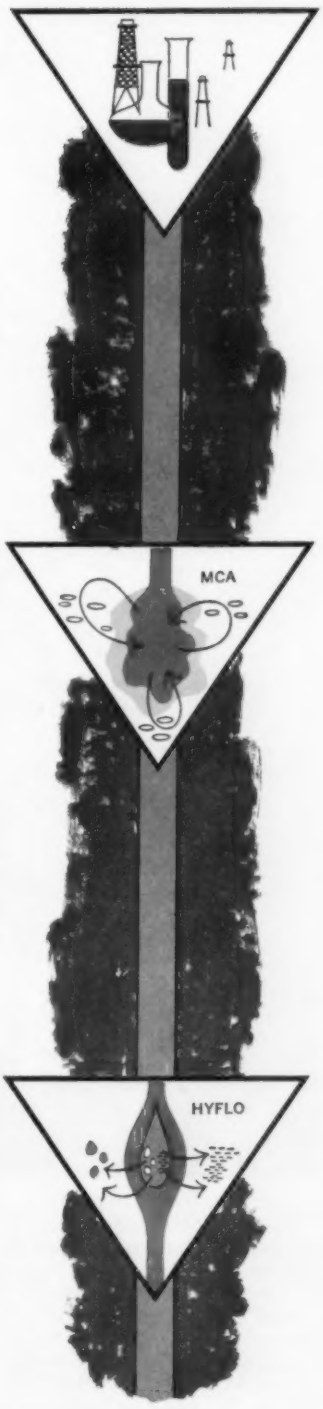

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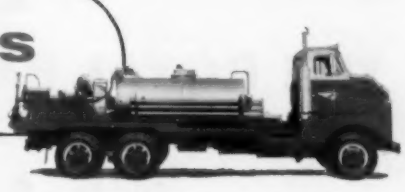
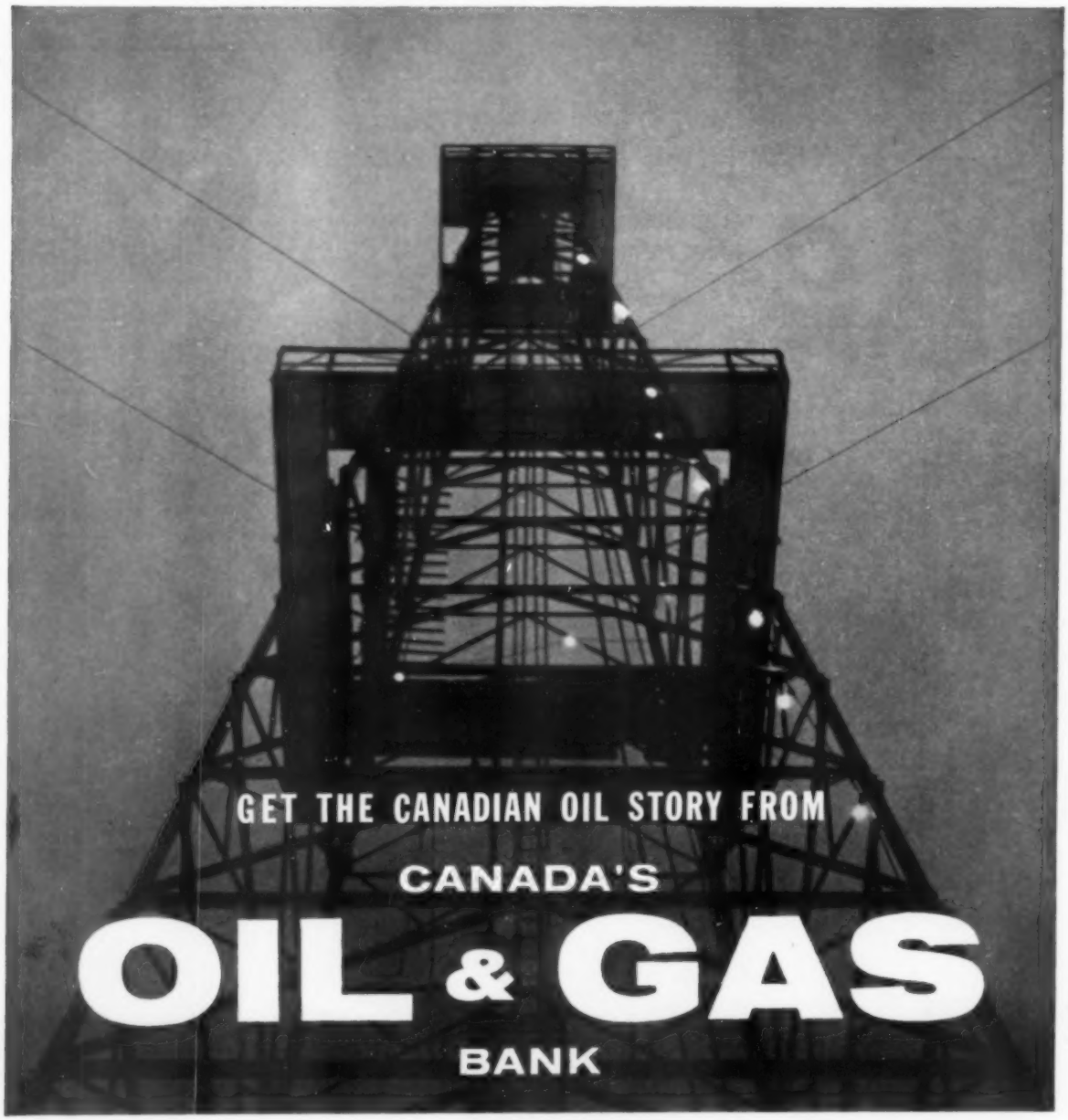
284 SERVICE CENTERS..."CREATIVE CHEMISTRY WORKING FOR YOU"





If you are interested in Canada's expanding oil and gas industry, you will find the Royal's *Special Bulletin Service* of value. These bulletins, issued by our Oil and Gas Department, are frequently revised and contain information on all important aspects of the industry—regulations, tariffs, financing, statistics and kindred topics. For a list of current bulletins, write The Royal Bank of Canada, Oil and Gas Dept., 409 Eighth Ave. W., Calgary, Alta.

This service is but one of many useful functions performed by our Oil and Gas Department. Manned by practical "oil bankers" with long experience in the field, it is well organized to assist oil and gas men in the financial aspects of their operations.

Facilities like this, plus the fact that we operate over 300 branches throughout the oil-rich Western provinces, explain why the Royal has become known as Canada's "Oil and Gas Bank."

THE ROYAL BANK OF CANADA

Head Office: Montreal

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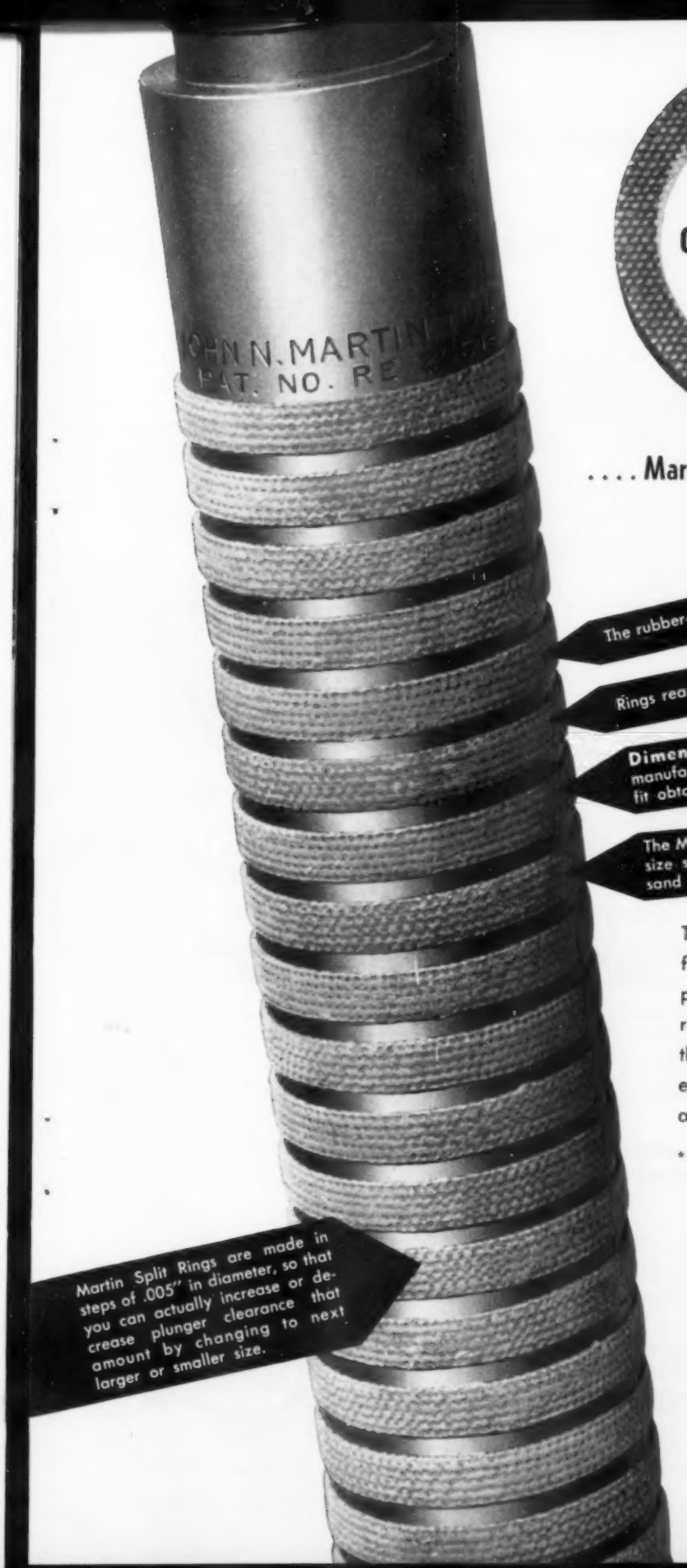
Over 900 branches in Canada, West Indies, Central and South America • Offices in New York, London and Paris • Correspondents the world over

Total Assets Exceed 3¼ Billion Dollars



GETTING CORRECT RING FIT IS EASY WITH

.... Martin Plungers and the Martin Method of Installation*

The rubber-and-duck rings swell **just so much** and no more.

Rings reach maximum size in the well within a few hours.

Dimensional Compensation during the manufacturing process assures the uniform working fit obtained with Martin Split Rings.

The Martin Ring Size Guide Table* assures proper ring size selection for various gravities, temperatures and sand and water content.

Martin Split Rings are made in steps of .005" in diameter, so that you can actually increase or decrease plunger clearance that amount by changing to next larger or smaller size.

The gaps between the Martin Rings cause fluid turbulence which slows down slippage past the Martin Plunger — just as a rough road slows down your driving speed. Actually, the Martin Plunger maintains pumping efficiency with a looser fit than is possible with a smooth surface plunger.

* See the complete Martin Catalog and instructions in the 1957 Composite Catalog.

JOHN N. MARTIN
Manufacturer
9 W. BRADY • TULSA, OKLA.

New ECONOMY with complete SAFETY

RECTOR UNIBOLT
Dual String Christmas Tree

The Rector Unibolt Tree is the only dual-string assembly to make use of Unibolt connections throughout, eliminating the weakness of threaded connections and the inconvenience of an all-welded hook-up. It provides two separate verticals clamped together and can be assembled and disassembled the same as a flanged tree, only quicker and easier.

UNIBOLT CONNECTORS provide high-pressure metal-to-metal seals with virtually the same positive safety factor as flanged connections.

With the new Rector Unibolt Christmas Tree assembly you get the safety of METAL-TO-METAL high-pressure seals between each connection . . . without the expensive dual master valve required in flanged trees.

Ask your Rector representative or your favorite supply store about the many advantages of this new field proven dual-string assembly.

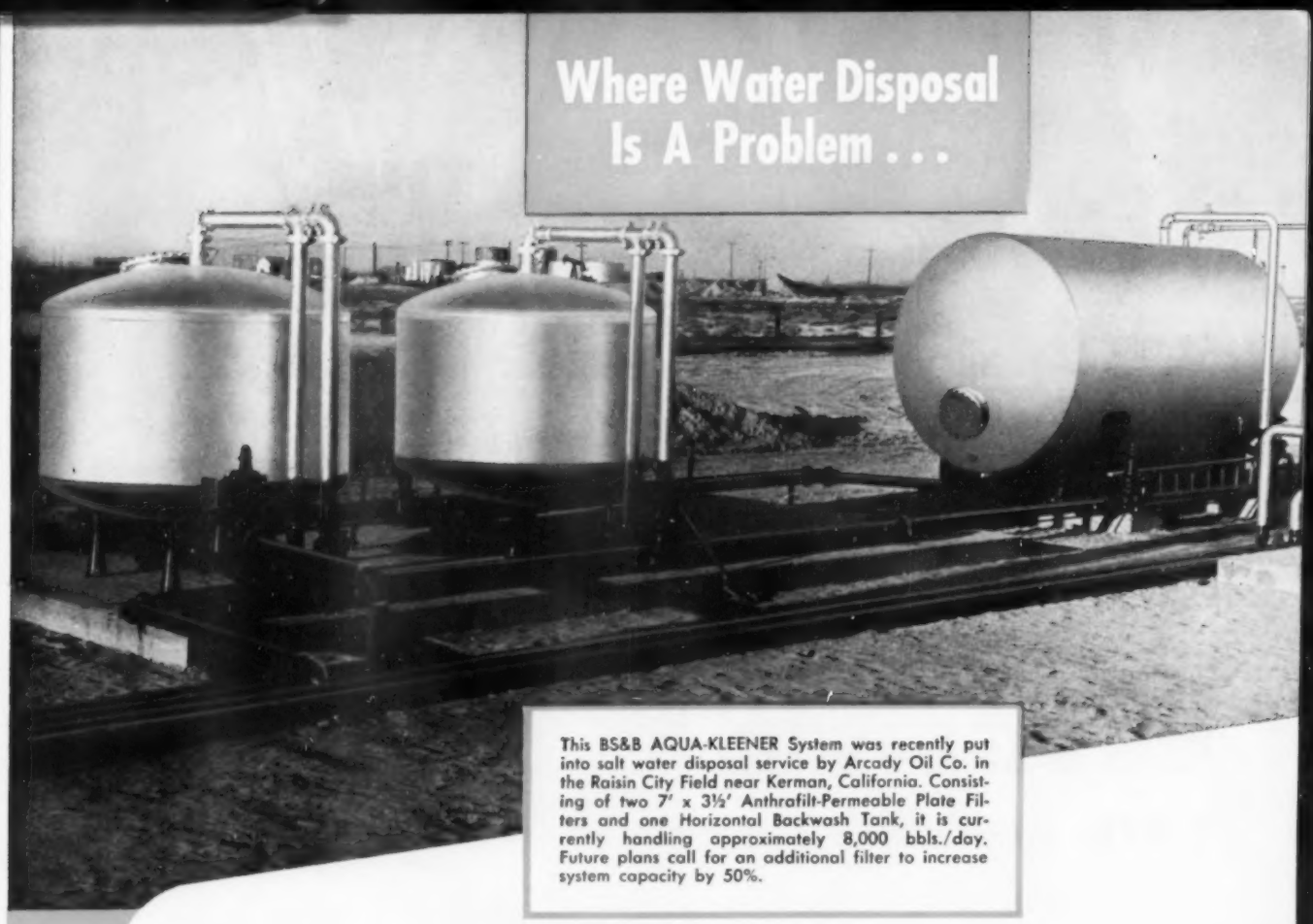
RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

EXPORT REPRESENTATIVES: Continental Supply Company • Mid-Continent Supply Company • Oil Well Supply Company



This BS&B AQUA-KLEENER System was recently put into salt water disposal service by Arcady Oil Co. in the Raisin City Field near Kerman, California. Consisting of two 7′ x 3½′ Anthrafilt-Permeable Plate Filters and one Horizontal Backwash Tank, it is currently handling approximately 8,000 bbls./day. Future plans call for an additional filter to increase system capacity by 50%.

Install a BS&B AQUA-Kleener® System!

Today, more and more oilfield production men are turning to the BS&B AQUA-KLEENER System as a practical and economical solution to the problem of lease-produced water disposal without the contamination of land areas or surface waters, and without clogging of water injection wells.

Through an improved process of settling and filtering, AQUA-KLEENER removes oil traces and solid particles, and prevents air from contacting the water—thereby reducing precipitation due to oxidation of iron, minimizing corrosion, holding carbon dioxide in solution, retarding aerobic bacteria growth, and in most cases, eliminating the need for chemical treatment of the water.

Each of the components of the AQUA-KLEENER System can be utilized separately or in various combinations, as determined by the type of application and degree of water conditioning required.

If you have a water injection or disposal problem, it will pay you to get full details on BS&B AQUA-KLEENER — today's outstanding water conditioning and filtering system! Ask your BS&B Man — or write to . . .

EFFICIENCY OVER 60 YEARS RELIABILITY
BS&B
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. 1-A3A

P. O. Box 1714

Oklahoma City, Oklahoma

THE HEAVIER THE LOAD...

the more you need HYATTS . . . because size for size, no other kind of bearing made can equal straight cylindrical roller bearings for sheer load-carrying capacity in heavy-duty service. That's why John Deere uses HYATTS in this combine.

THE HIGHER THE SPEED...

the more you need HYATTS . . . because their uncompromising combination of superior steels, precision manufacture and scrupulous control of internal clearances assures smoother performance in high-speed applications like the famed *Firebird II.*

THE MORE YOU NEED *Cylindrical* HY-ROLL BEARINGS

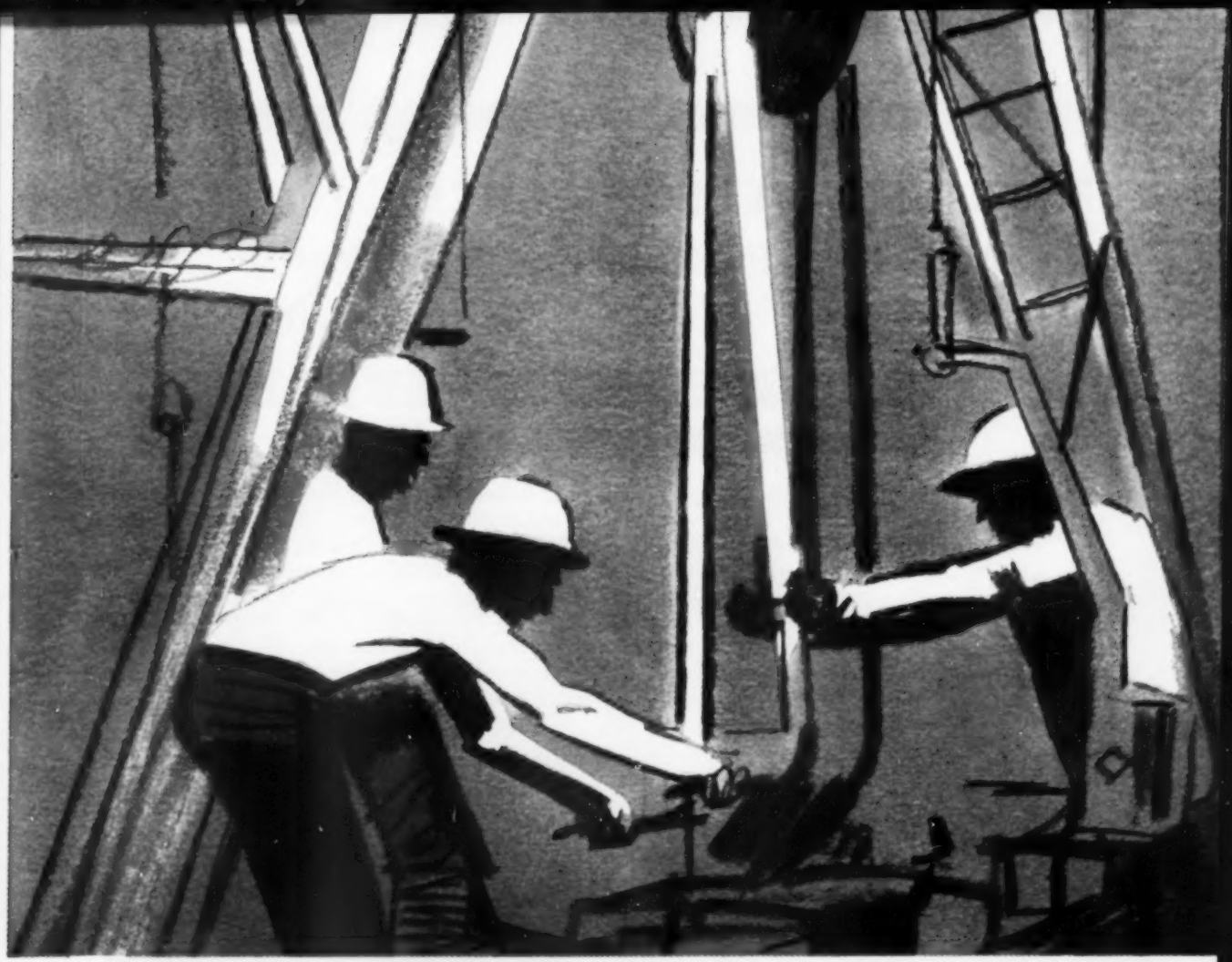
Today, with loads and speeds trending upward and space often at a premium, many a manufacturer is finding that bearings of limited capacity are no longer good enough. If you are seeking ways to squeeze better life/load ratings into smaller housings, HYATT has the answer. Shouldered-race HYATT HY-ROLLS will not only solve your radial load problem but take a surprising amount of thrust, too. Ask your nearest HYATT Sales Engineer for recommendations—he's a mighty good man to know! Hyatt Bearings Division, General Motors Corporation, Harrison, N.J.; Pittsburgh; Detroit; Chicago; and Oakland, California.

THE RECOGNIZED LEADER IN CYLINDRICAL BEARINGS

1908–1958 GM FORWARD FROM FIFTY

HYATT HY-ROLL BEARINGS

THE "WORKHORSES" OF MODERN INDUSTRY



Sign of Water....Layne

Vital to most petroleum operations is a guaranteed supply of water. Water for removing heat loads, process consumption and accompanying plant operations—all require determined amounts for an hour, a day, a year—indefinitely. That's why the well site must be accurately determined and the well constructed to deliver the available water.

Layne wells circle the globe. Every condition and every problem possible has been met and solved. This know-how and over three quarters of a century of experience result in efficient, economical wells—the basis of many industrial water systems. Layne drilled wells provide a reliable water source—the criterion for industrial water supply.

LAYNE & BOWLER, INC., **MEMPHIS**
GENERAL OFFICES AND FACTORY • MEMPHIS 8, TENN.
LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

Layne

WATER WELLS • VERTICAL TURBINE PUMPS
WATER TREATMENT

TO: LAYNE & BOWLER, INC.
MEMPHIS 8, TENN.

Gentlemen: Please send me bulletin No. 100

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*ORGANIZATION*_____

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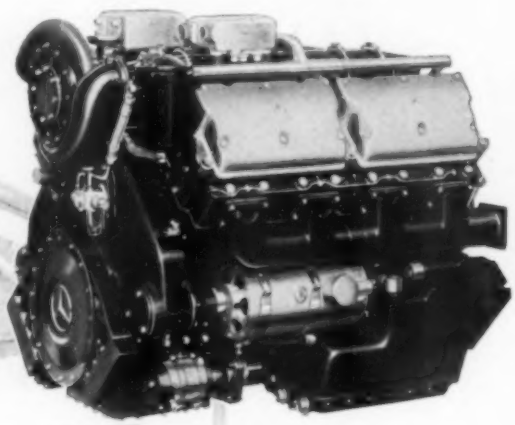
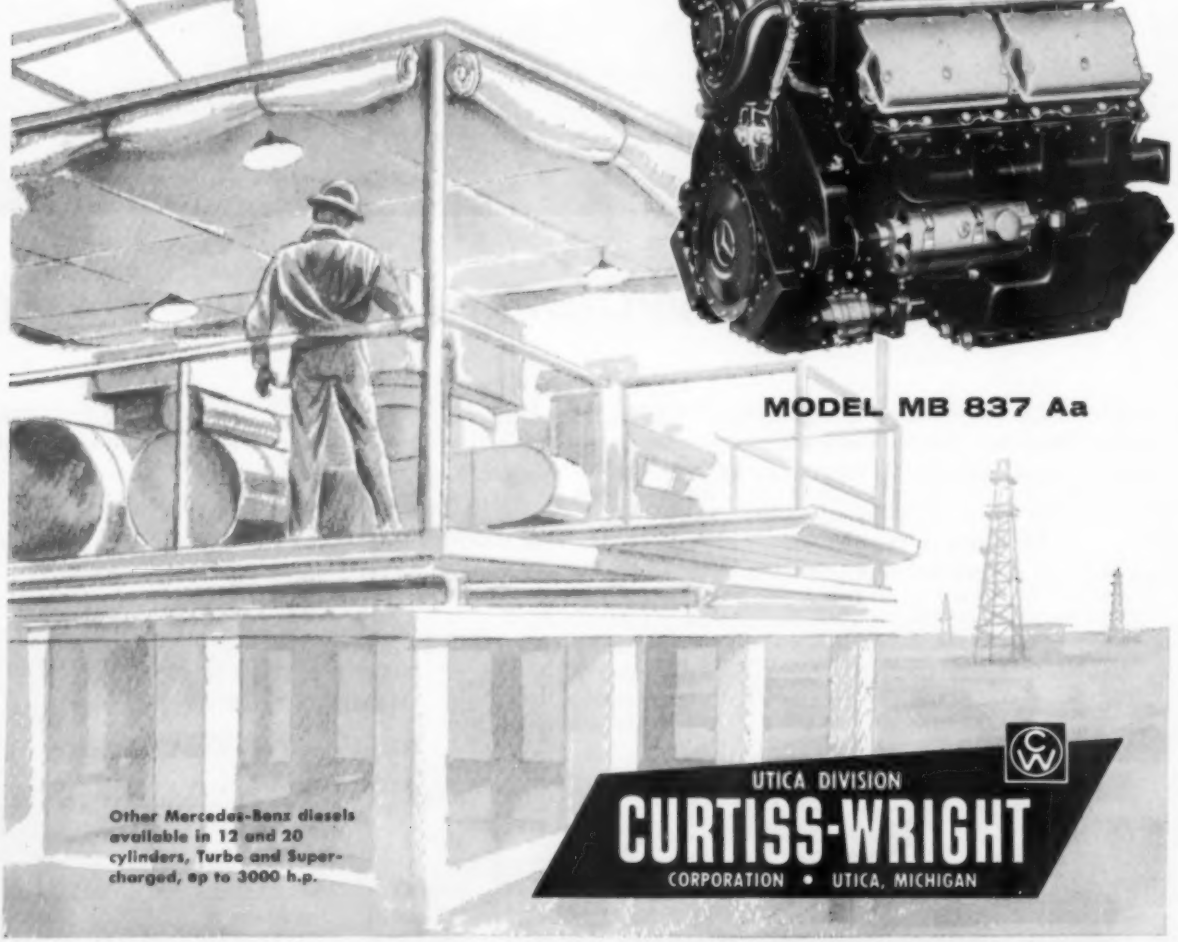
EFFORTLESS PERFORMANCE FROM START TO FINISH

MERCEDES-BENZ
DIESEL ENGINES

Mercedes-Benz diesel engines are powered to meet the toughest requirements of the petroleum industry—both inshore and offshore operations . . . They are designed and built to provide low-cost power for rugged, deep drilling, pumping, electrical generating and innumerable other specialized applications . . . High horsepower to weight ratio and compact size permit room for other rig equipment . . . Their unusually long engine life and exclusive Mercedes-Benz design allow continuous operation under extreme climatic conditions . . . Your Mercedes-Benz dealer can supply you with complete information on the full range of models from 36 to 3000 h.p.



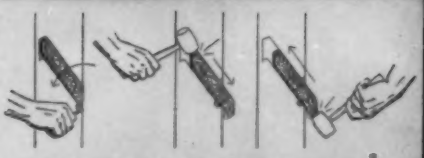
MODEL MB 837 Aa



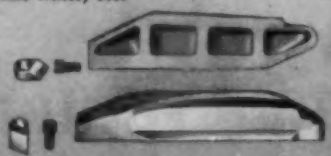
Other Mercedes-Benz diesels available in 12 and 20 cylinders, Turbo and Supercharged, up to 3000 h.p.

UTICA DIVISION
CURTISS-WRIGHT
CORPORATION • UTICA, MICHIGAN

these four design features are why the *Servco Model B Stabilizer* is fast becoming the most popular stabilizer in the world!



1. **WINGS ARE EASIER TO CHANGE**—Worn wings can usually be changed without removing the body from the string. Wings are machined to close tolerances to insure interchangeability and proper fit. Corrosion and galling are prevented by "Parkerizing." Wings can be quickly removed or installed even after rough usage and exposure to corrosive mud, salt water, etc.



2. **WINGS DO NOT COME OFF IN THE HOLE**—Wings are made of ductile iron—a new material with the castability and machinability of gray iron and the mechanical properties of cast steel. This material, plus a positive lock, prevents wings from coming loose in the hole.

3. **WINGS ARE EASILY WASHED OVER**—Although the use of ductile iron gives the wings greater strength, wash over operations can be accomplished with the use of a conventional wash over shoe. Wings are cored for easier milling and to minimize the amount of material removed. No large pieces to foul up the hole.

4. **WINGS ARE CAST ON A HELIX**—Casting wings on a helix allows smooth rotation in the hole with *maximum* stabilizing contact with the wall of the bore hole. All contacting surfaces are hard faced with tungsten carbide for maximum resistance to wear.

Servco Model B Stabilizers are available in a complete range of sizes—all of which will accommodate surveying instruments. For complete information see pages 4710 and 4711 in the Composite Catalog or write for Folder.

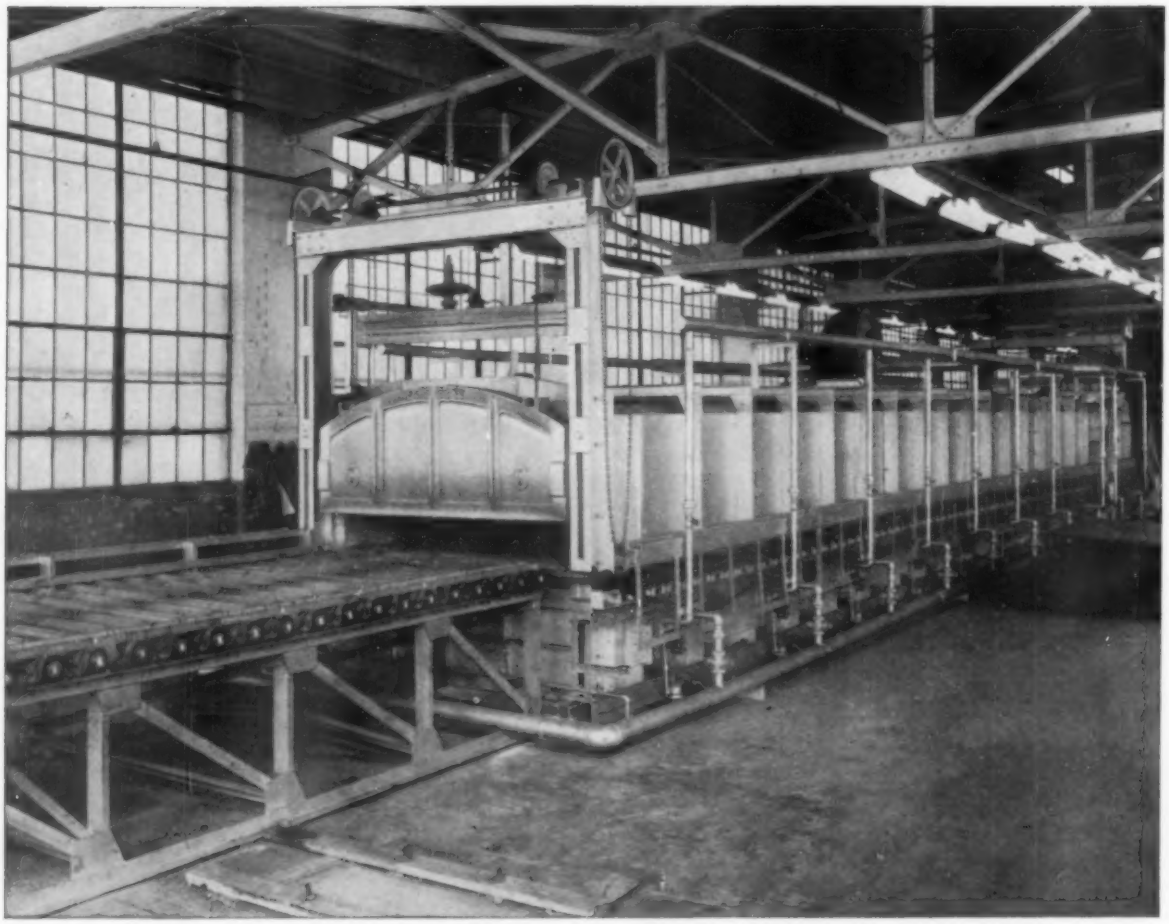
SERVCO

SERVCO

Houston, Texas: 4920 Holmes Road, Zone 21

General Offices: Long Beach, California; 904 Security Bldg., Zone 2

Field Offices: VENTURA • BAKERSFIELD • LAFAYETTE • HARVEY • EDMONTON



Sheffield Completing Latest In Alloy Steel Heat Treating Facilities

SHEFFIELD
ARMCO
Heat Treated Alloy and Carbon Steels

Sheffield, the west's leading producer of alloy steels, is completing installation of the latest in heat treating facilities at Sheffield's fully integrated Houston plant.

Early this year, Sheffield will be fully equipped to furnish alloy steels, heat treated to individual requirements, to produce the desired strength, hardness and ductility to meet your requirements. Other thermal treatments will be available to produce maximum machinability and ease of fabrication.

In the meantime, we invite your inquiries and offer the services of our experienced metallurgical staff in ordering, to determine the type of heat treated alloy steels most suitable for your application, at the lowest possible cost.

We believe heat treated alloy steels will increase your production efficiency, lower your costs and improve the quality of your product.

SHEFFIELD DIVISION ARMCO STEEL CORPORATION SHEFFIELD PLANTS: HOUSTON • KANSAS CITY • TULSA

I'M GLAD THIS RIG HAS WECO IRON!

Good "Iron" can make the difference between profit and loss on a drilling contract. Crewmen like to work with equipment that is safe and able to "take it" without special handling. Operators and owners are happy to add up the savings in time and money that come from using quality "iron."

WECO Unions are good "iron." Full-circle metal-to-metal contact sealing of WECO's ball and cone seats holds the highest pressures under all conditions of surge and vibration. Tough, strong nuts and subs forged or cast from high grade steel give long service, even under the hard usage of today's competitive drilling programs. WECO Unions available in sizes 1" through 12", in pressures from 1,000 through 15,000 psi.

Sold by Supply Stores Everywhere.

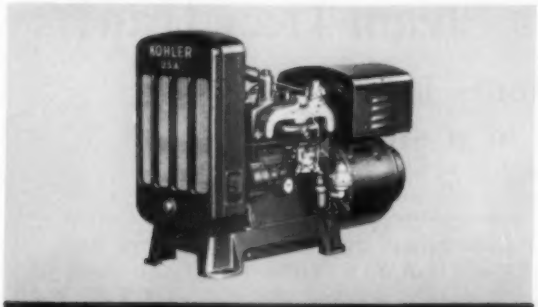
U-4-58

WECO®

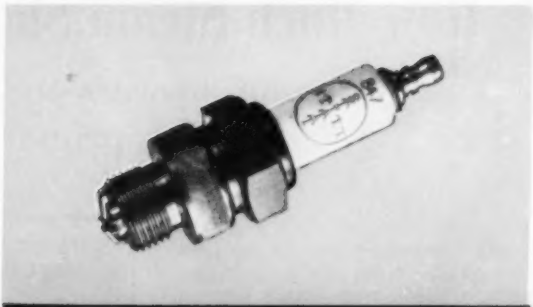
WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

Waukesha
WAUKESHA Engines are world-famous for their economy and reliability. We carry a complete line of Waukesha Engines, Power Units and Genuine Waukesha parts. Natural gas, LPG, Diesel, Gasoline, ranging from 10 to 1100 hp.
WAUKESHA SALES & SERVICE,



KOHLER **KOHLER** Electric Plants and Air-Cooled Engines provide an independent source of electric power capable of performing hundreds of routine jobs as well as providing essential standby protection against power failure. 500 watts to 30 kw.



STITT Industrial Spark Plugs are designed for continuous heavy-duty service. Massive center electrodes, three wide ground wires and extra-heavy construction, with modern, aluminum oxide insulators, make for economy and long life.

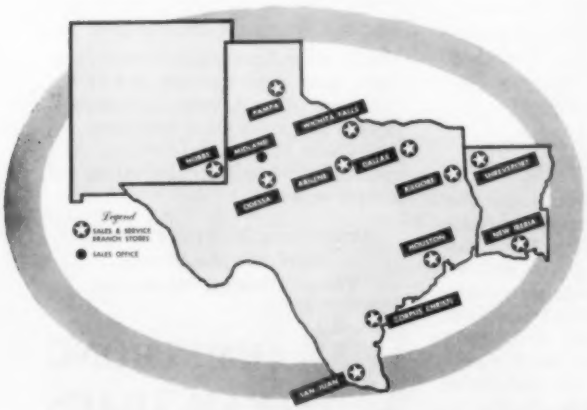
MARINE PRODUCTS Pumps—MP Straight Centrifugal Pumps for general applications, Flomax Self-Priming Centrifugal Pumps and Duraflex Rotary Pumps.

AMERICAN M.A.R.C. Diesel Power Units are well-known for low maintenance cost and operating economy. American M.A.R.C. Air-Cooled Engines are the ideal power plant wherever a 5 to 15 hp requirement exists.

Inc. COVERS A LOT OF GROUND

From the Permian Basin to the coastal flats, Waukesha Sales & Service, Inc. is ready to serve you, around the clock. With twelve service points serving a four-state area, your engine is never more than a few hours away. And when you send your engine "home" to Waukesha Sales & Service, Inc. you are assured of **genuine** Waukesha parts and other name brand equipment, plus expert workmanship.

WAUKESHA SALES & SERVICE, INC. supplies dependable power for every need: drilling, pumping, hoisting, lighting, transportation. Our expert, personalized service keeps this power in tip-top shape.



Service is Our most important product

WAUKESHA SALES & SERVICE, INC.

1422 Maury Street, Houston, Texas

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS
IN TEXAS, NORTH AND WESTERN LOUISIANA, SOUTHERN
ARKANSAS AND NEW MEXICO

WORLD'S LARGEST DISTRIBUTOR OF OIL FIELD ENGINES

How Much Steam Should a Steam Trap Trap?

. . . some answers to commonly asked questions about the primary job of a steam trap

You don't need a doctor's degree in thermodynamics to answer the question at the top of this page. Naturally, a steam trap should trap *all* the steam.

Unfortunately for you, the problem isn't quite that simple. After all, a shut off valve would trap all the steam . . . and condensate, and air, and carbon dioxide as well.

So we'd better amend the answer to the question this way: A steam trap should trap *all* the steam but *must* remove condensate, air and carbon dioxide as rapidly as they accumulate.

With this established, let's take a closer look at what's involved:

A Steam Trap Should Trap All The Steam

If you've had experience with several different makes of traps, you already know that some trap steam better than others. The operating principle of the trap is what makes the difference. We like to talk about it because Armstrong traps are designed so that no steam can get to the orifice. The valve is always water sealed. Result: *More efficient steam utilization, lower fuel costs.*

A Steam Trap Should Remove Condensate

All traps remove condensate—after a fashion. For maximum efficiency in the unit being drained, though, the trick is to get it out without waiting for it to cool and without leaking steam.

Armstrong's water sealed valve takes care of steam leakage. The inverted bucket operating principle opens the trap for water regardless of its temperature. This means you get the condensate out as quickly as it accumulates. Result: *Higher temperatures and better heat transfer in steam heated units.*

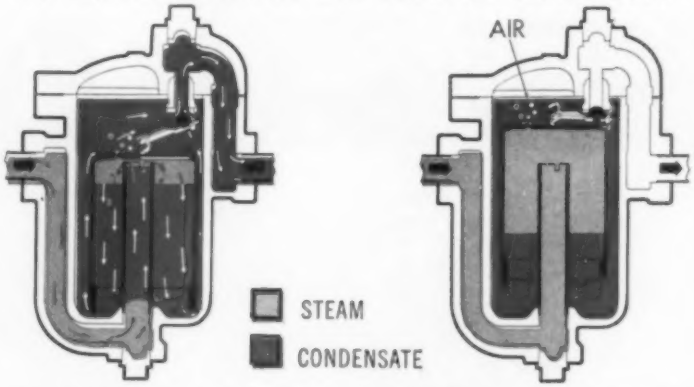
A Steam Trap Should Remove Air and CO_2

Part and parcel of the condensate removal problem is removal of air as well as oxygen and carbon dioxide—two real troublemakers. Air tends to reduce operating temperatures and interfere with heat transfer. CO_2 goes into solution to form corrosive carbonic acid which, for example, can eat unit heater tubes. O_2 aggravates the situation. Believe it or not, but all traps don't properly remove air and CO_2.

By now, you've probably guessed that Armstrong traps *do* remove air and CO_2. Armstrong design (see illustration) provides continuous venting of air and CO_2. By opening suddenly, the Armstrong trap creates a momentary pressure drop to "pump" the air down to be vented. Result: *Higher temperatures, faster heat-up, better heat transfer and reduced corrosion.*

Note: When required, specially sized air vents are furnished. For fast heat-up of low pressure on-and-off units, Armstrong provides open float and thermostatic air vent traps.

HERE'S THE STEAM TRAP DESIGN THAT GETS RID OF CONDENSATE AND AIR WITHOUT STEAM LOSS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

What's the Final Answer?

Summing it all up, you'll get the best service from steam heated units that are equipped with traps designed to trap *all* the steam and remove air and condensate as quickly as it accumulates. In our prejudiced viewpoint, this means Armstrong traps. More important are the several thousand users of Armstrong traps who have proved the point.

Before you make up your mind, though, consider the minimum maintenance requirements of Armstrong traps . . . and the convenient assistance your local Armstrong Representative provides. These are important plus values.

Put Up or Shut Up

We're so confident that we "put up". Armstrong traps are unconditionally guaranteed to satisfy. So you can find out for yourself with practically no risk. If you're not completely satisfied with the way they do their job, you can get your money back.

* * *

The 44-page Armstrong Steam Trap book goes into greater detail on these and other Armstrong features. It also discusses trap selection, installation and maintenance. Ask your Armstrong Representative for a copy or write

Armstrong Machine Works
8684 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

How to save 20% in joining a pipe line

Line-up and welding costs can take a big part of your pipe line construction dollars. But here is how Armco Welded Steel Pipe can reduce these costs by as much as 20 per cent.

Armco Pipe is supplied in standard 50-foot lengths instead of the ordinary 40-foot or double-random lengths. This means at least 20 per cent fewer field joints. Line up and welding time is reduced and you have fewer sections to handle.

What's more, the wide range of diameters (6 to 36 inches) and wall thicknesses ($^{9}/_{64}$- to $^{1}/_{2}$-inch) available in Armco Pipe lets you make the most economical choice to meet your specific requirements.

Use Armco Welded Steel Pipe to meet requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Mail coupon below for prices and delivery time. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3968 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

Armco Drainage & Metal Products, Inc.
3968 Curtis Street, Middletown, Ohio

Send me prices and delivery time on Armco Line Pipe. I am interested in the following: diameter_____

wall thickness_____ quantity_____

_____

Name_____ Title_____

Firm_____

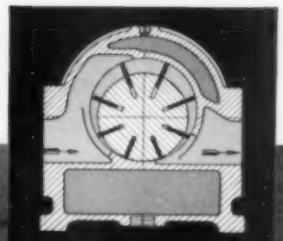
Street_____

City_____ Zone____ State_____

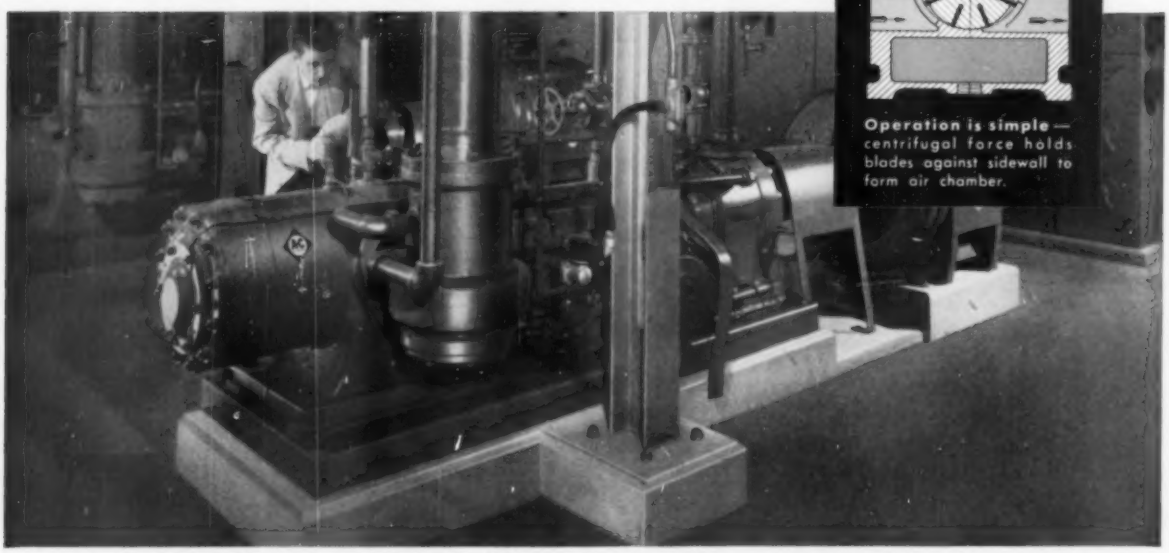
ARMCO®

Armco Welded Steel Pipe

Ro-Flo COMPRESSORS



Operation is simple—centrifugal force holds blades against sidewall to form air chamber.



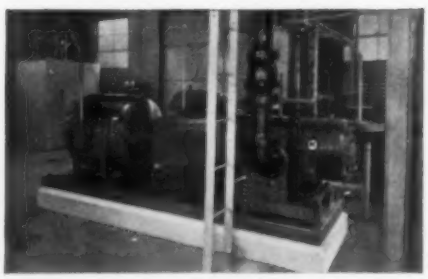
Ro-Flo units at a Midwest utility supply air for mixing with vaporized propane gas to meet an increased demand for natural gas.

No shake...no shimmy...no shock!

Rotary operation produces a remarkably stabilizing effect. You don't get the shimmy and shock inherent in reciprocating compressors.

Users in many industries have discovered that *Ro-Flo* compressors eliminate the cost of heavy foundations. A simple slab is enough. Smaller units are bolted directly to the floor. Automatic wear compensation at the rotor blades keeps compressor efficiency at high level even after years of use. There are only two wearing parts.

Ratings—Choose from twelve sizes of two-stage *Ro-Flo* compressors, ranging from 250 to 1800 cfm at pressures from 60 to 125 pounds gauge. Single-stage *Ro-Flo* units handle pressures up to 50 pounds gauge, and handle volumes from 40 to 3000 cfm.



Two-stage *Ro-Flo* compressor, installed in natural gas pipeline booster station. Unit provides make-up gas to help maintain line pressure for peak loads.

Mobile *Ro-Flo* compressors used on emergency equipment for fighting oil tank fires at a Texas oil storage area.

For complete information on Allis-Chalmers rotary compressors, ask for two-stage Bulletin 16B8244 or single-stage Bulletin 16B8126. Call your nearby A-C office or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.

Ro-Flo is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

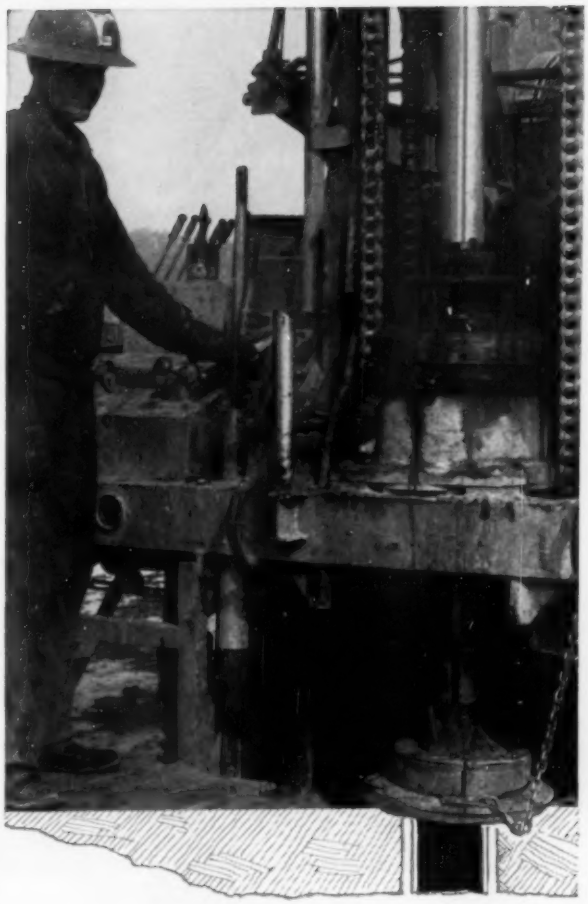
A-5410

Rides with the bit through rock ...speeds big bore hole cuts...

GARDNER-DENVER

"MOLE-DRIL"*

* TRADE-MARK



Here's added power for your seismograph rig—hard-hitting, in-the-hole power. "Mole-Dril" speeds shot hole drilling . . . and deep hole drilling in hardest rock.

It's easy to use—the "Mole-Dril" screws directly onto the bottom of standard drill pipe . . . a tungsten-carbide "X" bit screws directly onto drill tappet. That's all the "make-ready" it takes to send the "Mole-Dril" through rock.

It's powerful—"Mole-Dril" delivers more foot-pounds of energy to the bit than any other drill of its size. Every pound of hammer energy is transferred directly to the bit.

It's rugged—the "Mole-Dril" has only three moving parts, nine major parts. This simple, rugged construction gives the "Mole-Dril" lasting deep hole drilling durability.

Two models available:

Model AM4 for drilling $4\frac{3}{4}$" diameter hole.
Model AM6 for drilling $6\frac{1}{2}$" diameter hole.
Write for bulletin.

"Mole-Dril's" positive hole cleaning action

Air at full line pressure flows through drill's air blowing tube directly to bit . . . this direct air stream keeps cutting face clean regardless of drilling depth.

Drill exhaust air passes out up-cast air ports and gives cuttings an additional out-of-the-hole boost.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Gardner-Denver Export Division, 233 Broadway, New York, N. Y.
Oil Field offices: Dallas, Houston, Tulsa, St. Louis, Los Angeles, New York, Pittsburgh, Denver, New Orleans, San Francisco, Kansas City, Winnipeg, Edmonton

For better, longer-lasting protection—paint it with

Humble's protective coatings

In refineries and chemical plants where strong acids, alkalis and salt sprays produce severe corrosive conditions, Humble's protective coatings can save you hundreds of dollars in corrosion damage. Humble's protective coatings contain rust-preventing ingredients that not only provide surface protection, but also neutralize any corrosive substances that may get through the surface protection and attack the metal. And they give excellent resistance to weathering, plus good color and gloss retention.

Originally developed to protect Humble equipment, Humble's protective coatings have proved their value through years of extensive use, and are now marketed the world over. Included in Humble's complete line of protective coatings are RUST-BAN®, vinyls, epoxies, phenolics, enamels and others. These coatings are available in a wide range of finish colors.

Without cost or obligation, one of Humble's trained engineers will make a thorough study of your needs and recommend a complete painting program for you.

• *For detailed information on how Humble's protective coatings can save you money, call your Humble salesman, or phone or write:*

Humble Oil & Refining Company
Sales Technical Service
P. O. Box 2180
Houston 1, Texas

HUMBLE OIL & REFINING COMPANY HUMBLE

for PRODUCTION SECURITY
specify LUFKIN . . .

IT'S CHEAPER TO BUY THE BEST
. . . *and avoid that costly "down-time"*

You Can Relax When Your Lease Is **LUFKIN EQUIPPED**

PLENTY OF "BEEF" WHERE IT COUNTS THE MOST

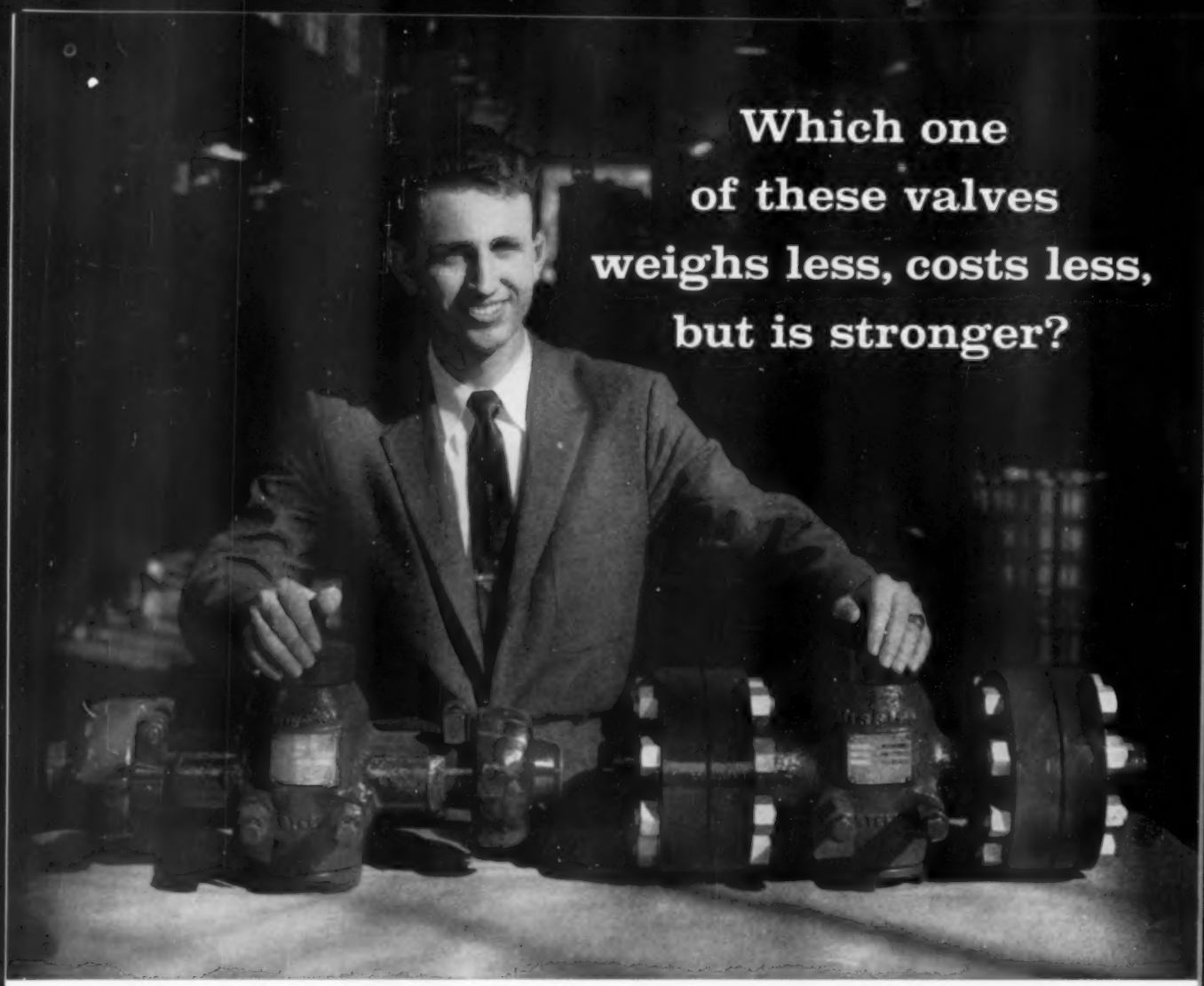
Long years of experience have proven the absolute necessity for the generous factors of safety designed into the gears, shafts, bearings and structural members of LUFKIN UNITS

Lufkin FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch Sales and Service: Houston • Natchez • Corpus Christi • Lafayette • Dallas • Kilgore • Odessa • Hobbs • Oklahoma City • Shreveport • Wichita Falls • Los Angeles • Bakersfield • Effingham • Casper • Denver • Sidney • Great Bend • Midland • Farmington • Seminole • Tulsa • New York • Pampa • Sterling • Maracaibo, Venezuela

Lufkin equipment in Canada is handled by
THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada



Both of these valves are of the same make, model, size, and pressure rating. One is equipped with 2″, 6000 lbs. test, Unibolt Couplings, the other with 2″, Series 900 flanges. The Unibolt-equipped valve weighs 102 lbs. less, costs about 10% less, and is approximately 28% stronger!

And the advantages don't stop there. Because it weighs less, the Unibolt-equipped valve costs less to ship and is easier to handle, easier to install. (Two bolts and nuts, compared to 16 bolts and 32 nuts.)

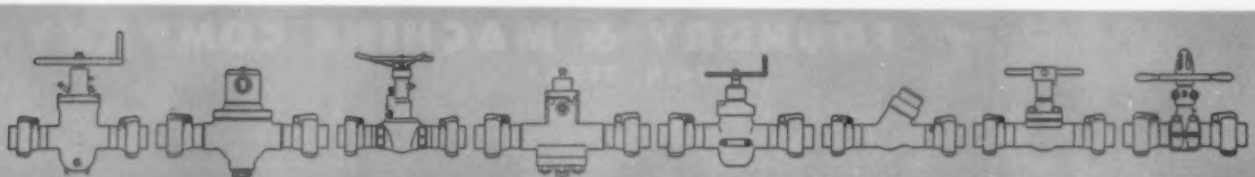
Unibolt Couplings are easy to attach to any valve. Either hub of the Coupling may be butt-welded, socket-welded or screwed to the valve body.

Even if steel were plentiful, Unibolt-equipped valves—as opposed to flanged valves—would be your best buy.

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

ask your supplier to furnish unibolt-equipped valves



ENCLOSED FIND:

19 years of engineering

Well service engineering has been the basic function of The Western Company since its beginning in 1939. This concept of research and field engineering in completion and remedial work has led to the creation of many new services and products for greater effectiveness in well servicing.

Western's Fracture Initiation Process* represents one of the more recent advances, and is in wide use throughout the Western area because of its unprecedented performance in initiating fractures and controlling the fracturing process.

F.I. was conceived and developed by research and field engineers to gain greater control in fracturing. Its ability to create and extend horizontal fractures has made it the most effective completion method available.

Fracture Initiation process is only one of many examples of Western engineering that provides more effective recovery methods. You will find the same engineering advantages in all Western products and services.

Western Engineering Makes the Difference!

*Exclusive with Western. Details on request.

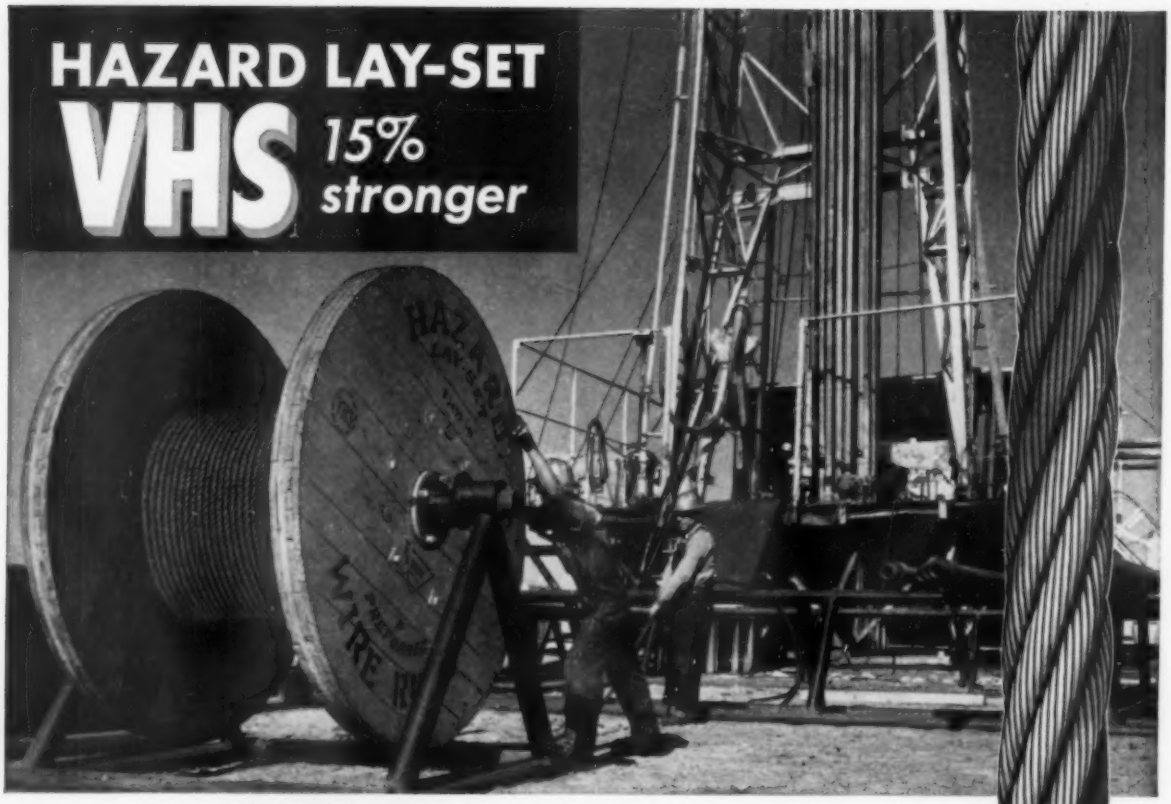
Integrated
wire line
and pumping
services
for the
Southwest:
logging
perforating
fracturing
acidizing

WESTERN Engineered WELL SERVICES

THE WESTERN COMPANY

general offices: Box 310, Midland, Texas

HAZARD LAY-SET VHS 15% stronger



Lay-Set VHS Wire Lines plus long lengths and proper cut-off practices...

Your answer to longer line life than ever before!

Have you begun a program of drilling line control similar to that adopted by many other operators which results in longer line life at no sacrifice in line safety? If not, you owe it to yourself to find out how this 3-point program can help you cut costs by getting never-before-equalled Ton-Mile advantages out of drilling lines.

Point 1—Use LAY-SET VHS lines exclusively because they are made of new tougher, wear-resistant high tensile rope wire—15% stronger than Improved Plow Steel. LAY-SET VHS has a greater resistance to abrasion and peening...vital in maintaining line shape and diameter. And LAY-SET VHS has the highest safety factor of any line available today, an advantage of increasing importance the deeper your drill stem goes.

Point 2—Buy LAY-SET VHS wire rope in sufficient length to allow for ample line reserve. Thus, you can make a maximum number of cuts in the line available before it must be completely discarded.

Point 3—Arrive at a predetermined cut-off schedule and stick to it! This way, you get greater serviceability from lines based upon the specific requirements of your rig.

Let our field man help you in selecting the right cut-off practice for your lines. When you call him, he'll leave a Ton-Mile Record Book containing reference tables and forms to assist you in carrying out his recommendations.

HAZARD WIRE ROPE DIVISION

American Chain & Cable Company, Inc.

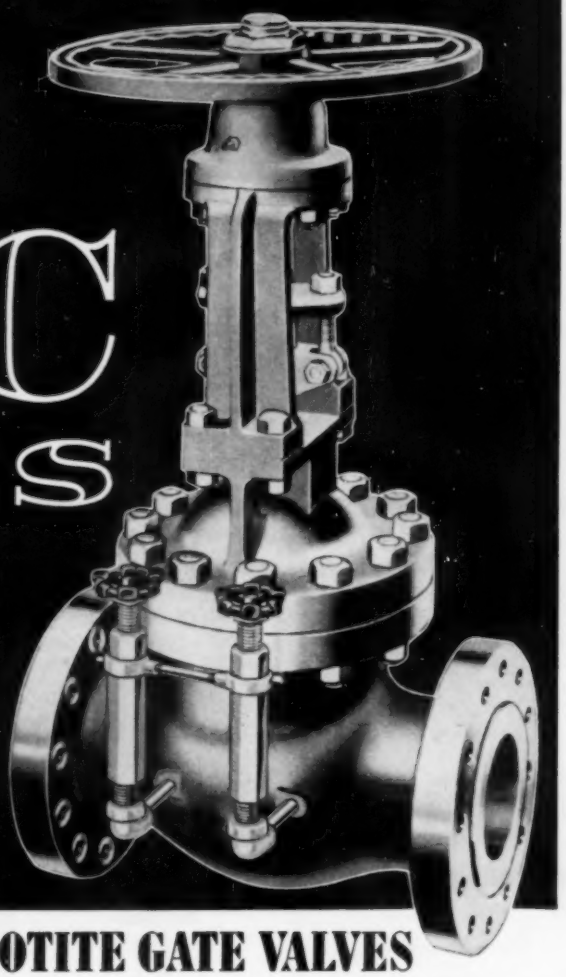
Sales Offices in: Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

PLANTS IN WILKES-BARRE, PA., AND HOUSTON, TEXAS

ACCO
for Better
Values

R-P&C VALVES

THE COMPLETE LINE
—DESIGNED FOR DEPENDABILITY



R-P&C "Sure-Tight" LUBROTITE GATE VALVES

—THE MULTI-SERVICE VALVES LUBRICATED THROUGH THE SEAT RINGS

Lubrotite Gate Valves—created and patented by R-P&C—are built to provide absolute tightness and long, trouble-free service in handling all fluids for which iron and cast steel valves are serviceable.

By the unique Lubrotite system, in which each seat ring is served by a Lubrotite gun, a lubricant seal is forced through to the valve's seating surface. This lubricant prevents leakage, retards corrosion, prevents sticking, reduces wear on seating surfaces and makes for easier operation. Net result: reduced operating, maintenance and over-all valve costs!

Available in cast steel and iron types. A wide variety of lubricant seals, each suitable for numerous services, can be furnished.

Lubrotite Gate Valves are giving highly successful service in handling—

Gasoline...Oil...Benzol...HF Alkylation...
other Petroleum Derivatives —

Natural and Artificial Gas...Air...
Helium Gas...Coke and Gas...Water —

Vacuum Service (evaporation, etc.)...
Feed Water Lines and Steam Plants —

Mine and Acid River Waters...
Certain Chemicals...Other Services

Lubrotite Gate Valves form a part of the complete R-P&C line, which includes gate, globe, angle and check valves in all standard materials; all in a wide range of sizes, styles and pressure classes. Order through nearby R-P&C Distributor. Write our Reading office for catalog.

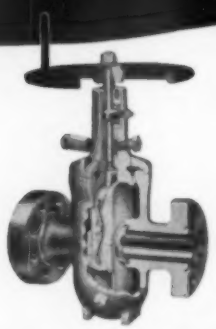
FREE WALL CHART
"How to Protect Your Valves"
Installation pointers, operating tips, clues to longer valve life. They are all on this 22" x 17" wall chart. Write for your free copy.

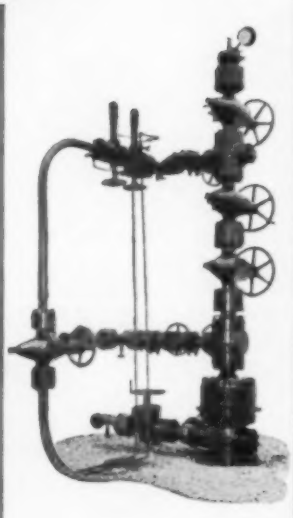
R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

W-K-M® THROUGH

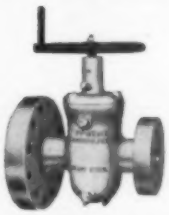




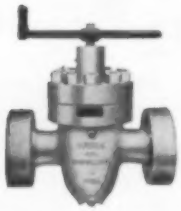
Screw-End Valves
Size: 2"
500 lbs. and 800 lbs. Working Pressure

Flanged Valves
Sizes: 2", 2½", 3" and 4"
1000 lbs. thru 5000 lbs. Working Pressure

Screw by Flange Valves
Sizes: 2", 2½", 3" and 4"
1000 lbs. thru 5000 lbs. Working Pressure



Unequal Flange Valves
Sizes: 2", 2½" 3" and 4"
1000 lbs. thru 5000 lbs. Working Pressure



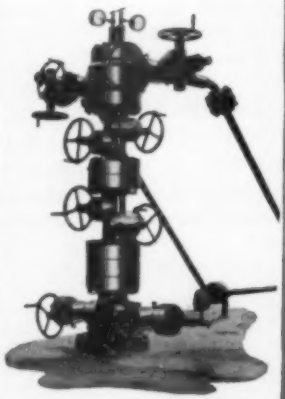
Bolted Bonnet Valves
Size: 4"
10,000 lbs. Working Pressure

Balanced Stem Valves
Sizes: 2", 2½", 3" and 3½"
10,000 lbs. Working Pressure
Sizes: 1⅜", 1⅝", 2⅛" and 2⅜"
15,000 lbs. Working Pressure

Cross Type Valve (4" cross)
Sizes: 6" x 6" and 6" x 7"
2000 lbs. thru 5000 lbs. Working Pressure

Unequal Flange Cross Type Valves (2" cross)
Sizes: 2", 2½", 3", and 4"
2000 lbs. thru 5000 lbs. Working Pressure

Recessed Body Valves
Sizes: 1½", 1¾", 2", 2½" and 3"
2000 lbs. thru 5000 lbs. Working Pressure



Drilling Valves
Sizes: 6" x 7" and 6"
2000 lbs. thru 5000 lbs. Working Pressure

CONDUIT GATE VALVES

FOR

EVERY PRODUCTION SERVICE

A wide range of sizes . . . working pressures from 500 to 15,000 pounds . . . flange, unequal flange, screw or screw by flange end connections . . . multiple zone completion valves and cross type valves give you the *right* choice in a W-K-M Valve for every well completion job. Easy operation, DOUBLE-TIGHT SEAL, long life and positive CONTROLLED FORCE SEATING make W-K-M Valves the safest and most economical to use in the oil field.

You receive two special benefits from the parallel expanding gate feature of W-K-M Valves. When the valve is being opened or closed, the gate and segment are contracted together by a powerful spring to allow a slight clearance between them and the body seats for easy operation. After the gates have reached the opened or closed position, the gate and segment expand with CONTROLLED FORCE SEATING against both the upstream and the downstream seats.

Acid and alkali resistant Teflon† inserts in the seat rings give DOUBLE-TIGHT SEALING to control the lightest of gases or the heaviest of crudes.

All standard W-K-M Valves have full-bore through conduits without crevices or other flow obstructions to cause turbulence and pressure loss. Special reduced port valves are available which provide all the advantages of standard valves, except that the conduit is of venturi design to permit a smooth flow transition with a minimum of pressure drop.

SUPERIOR FEATURES—STANDARD ON W-K-M

• Through-Conduit • Parallel Expanding Gates give CONTROLLED FORCE SEATING • Teflon seat inserts for DOUBLE-TIGHT SEAL • Two Thrust Roller Bearings • Pressure Seal Bonnet • Enclosed Packing Gland • Superfinished Stems • Fully Repairable while Installed*

Design and operating advantages, as well as sizes and dimensions of all valves are contained in W-K-M Catalog 200. Address Dept. A-317 for your copy.

W-K-M

DIVISION OF acf INDUSTRIES INCORPORATED

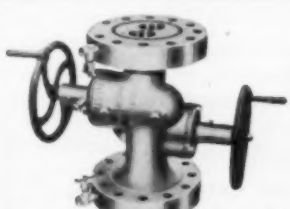
PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

W-K-M IS A REGISTERED TRADEMARK OF ACF INDUSTRIES, INCORPORATED
†DUPONT'S TETRAFLUOROETHYLENE RESIN. * PAT. PENDING.
© 1957, ACF INDUSTRIES, INCORPORATED.

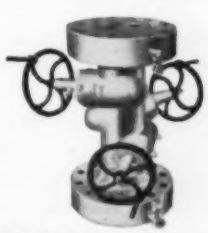
5721

MANUFACTURERS OF W-K-M GATE VALVES · ACF LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

Reduced Port Valves
Size: 2" x 1⅝"
5000 lbs. Working Pressure



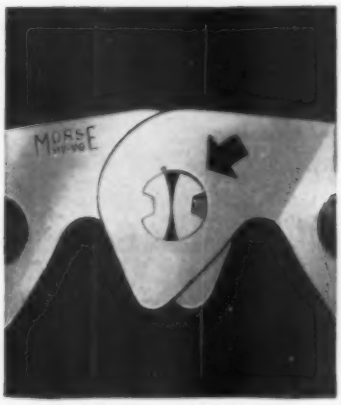
Dual Valves
Sizes: 1½" x 1½" and 1¾" x 1¾", 2" x 2", 2" x 2½", 2½" x 2½", 2½" x 3", 3" x 3"
2000 lbs. thru 5000 lbs. Working Pressure



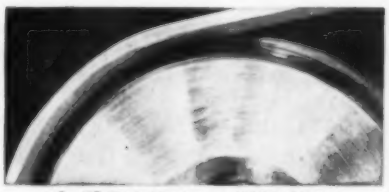
Triple Valves
Size: 2" x 2" x 2"
2000 lbs. thru 5000 lbs. Working Pressure

Morse HY-VO®... only chain drive field-proven at speeds over 4500 fpm

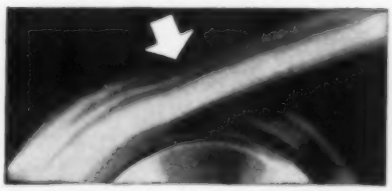
Here's what over 6 years' service in oil fields has shown about Morse Hy-Vo's unique features:



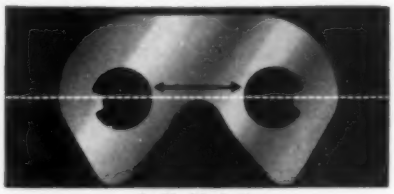
Exclusive Hy-Vo Joint



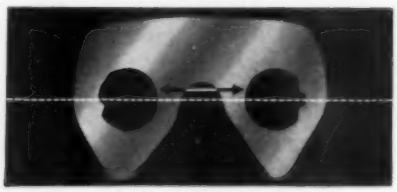
A. 2" Pitch Hy-Vo at 3600 F.P.M.



B. 2" Pitch Roller Chain at 3600 F.P.M.



A. Hy-Vo Link



B. Conventional Link

Exclusive Joint Design Ends "Freeze-Up" At High Speeds

Smooth, rolling action between pins eliminates sliding-joint wear. Reduced metal-to-metal contact prevents high-speed "freeze-up." Morse Hy-Vo runs ⅓ cooler than other chain drives.

Involute Teeth and Sprockets Give Smoother Power

Hy-Vo (A) is smooth as a belt at high speeds . . . prevents shock loading and stress that cause "humping" in roller chain (B). Permits use of heavier pitch chain, reduces width for a given load.

Stronger Links Provide Maximum Resistance to Fracturing

Thicker waist on Hy-Vo link (A) means that stresses are distributed across solid metal—not through crotch (B). This gives Morse Hy-Vo added protection against breaking at high speeds.

Morse Hy-Vo Drive gets *full* power from compact, high-speed diesels now being used in oil field applications. And it makes equipment more portable, less costly.

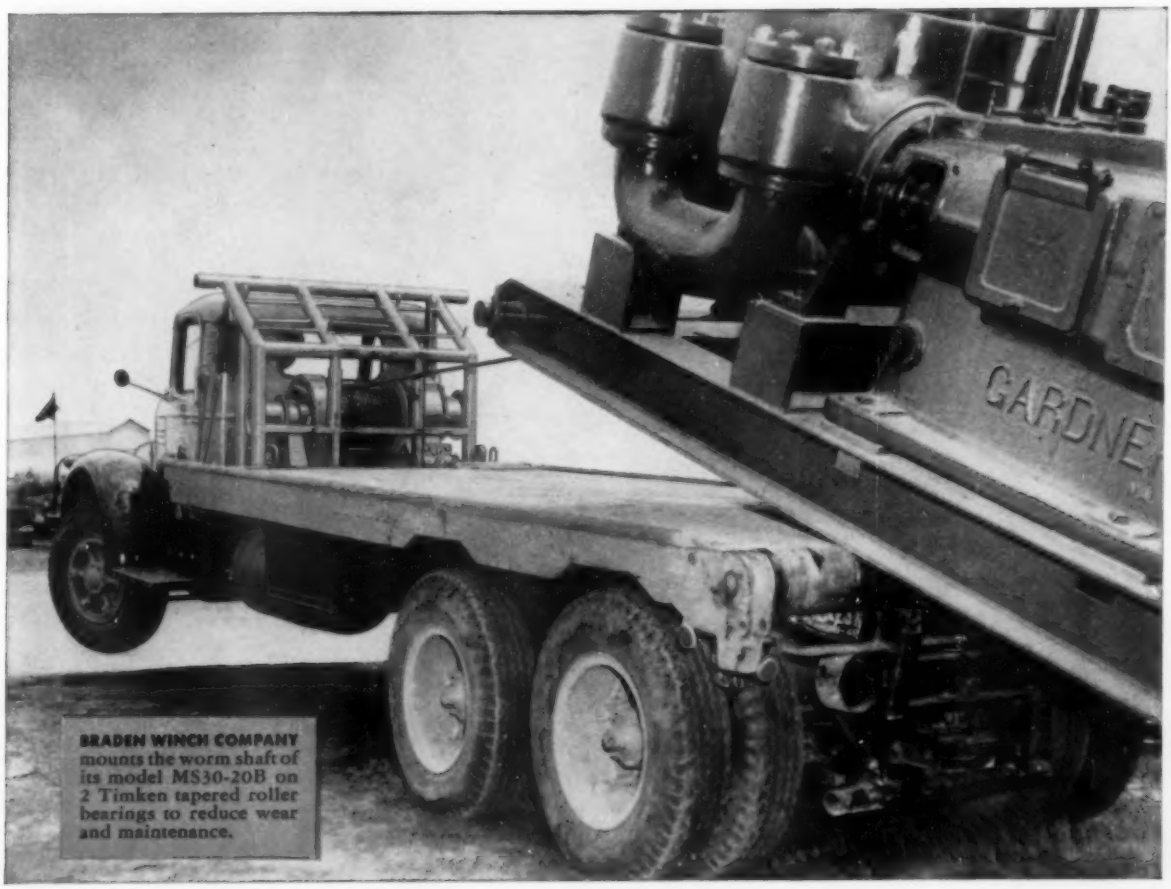
Contact your local Morse Distributor, headquarters for Hy-Vo sales and field service (he's listed in the Yellow Pages under "Power Transmission"). Or write: *MORSE CHAIN COMPANY, HOUSTON OR ODESSA, TEXAS; FARMINGTON OR HOBBS, N. M. Export Sales: Borg-Warner International, Chicago 3, Ill.*

IN POWER TRANSMISSION
THE TOUGH JOBS COME TO

MORSE BW

*Trademark

REMEMBER: Only Morse offers you all four of these basic drives: Hy-Vo, Roller Chain, Silent Chain, and "Timing"® Belt.



BRADEN WINCH COMPANY mounts the worm shaft of its model MS30-20B on 2 Timken tapered roller bearings to reduce wear and maintenance.

Truck rears back on haunches—but with TIMKEN® bearings winch takes load in stride

THE Braden winch above has a capacity of 30 tons—a gear ratio of 39 to 1. To meet the formidable loads placed upon heavy-duty winches such as this model MS30-20B, Braden mounts worm shafts on Timken® tapered roller bearings. The special tapered design of Timken bearings enables them to shrug off sustained heavy thrust as well as radial loads from the worm—keeps worm and worm gear accurately meshed for minimum friction, minimum wear.

Timken bearings are rugged enough to take the shock loads transmitted back through the worm because rollers and races are case-hardened to give them hard, wear-resistant surfaces over tough, shock-resistant cores. And friction is practically eliminated because Timken bearings are geometrically designed to roll true, manufactured with microscopic accuracy to live up to their design. This means the bearings normally last the life of the machine.

As an extra step to insure the quality of its bearings, the Timken Company makes its own fine-alloy steel. It's the only bearing manufacturer in America that does.

Next time you build or buy a machine, make sure it has Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

TRADE-MARK REG. U. S. PAT. OFF.

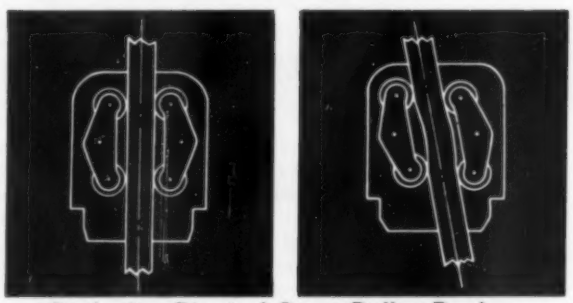
American Iron KELLY DRIVE-BUSHING

eliminates damaging Kelly whip and gyration*

SELF-ALIGNING . . . the pivoted-cage rollers in the new American Iron Kelly Drive-Bushing actually compensate for the small crooks and bends in the kelly! Now—for the first time—here is a kelly drive-bushing that assures centered kelly rotation above to the swivel . . . and below to the drill string! Unlike other multiple-roller kelly drive-bushings, the new American Iron kelly drive-bushing does not cause damaging whip and gyration movement to be transmitted to the crown block and below to the drill string!

Accurate Fit Without Adjustment at Rig!

There are no adjustments to make, no shims to put in or take out when installation is made on the kelly with the new American Iron Kelly Drive-Bushing. It helps the crew hold down-time to a minimum when changing kellys.



Exclusive Pivoted-Cage Roller Design greatly increases life of all rotating parts!

Get all the facts now from your American Iron Representative or your Supply Store man.

Self-Aligning Rollers

Four caged roller units (8 individual rollers) pivot at cage base pins to allow for nominal amount of kelly misalignment without introducing bending motion in kelly.

Positive Lubrication

All rollers are lubricated directly. No indirect lubrication system to become clogged and endanger both bushings and pins. No special grease is required.

**Resulting from misalignment of rotary table or crooked kelly.*

Another AMF Product
PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

AMERICAN IRON & MACHINE WORKS CO. INC. A OKLAHOMA CITY

DU PONT *Petroleum Chemicals* NEWS

Number 85 in a Series of Bulletins for the Petroleum Industry

MARCH 1958

ANOTHER DU PONT SERVICE...

New bulletin service provides tips on additives handling

The chief aim of our newest service is to make the use of additives as easy and economical as possible for Du Pont customers.

As a leading supplier of tetraethyl lead and other petroleum additives, the Du Pont Petroleum Chemicals Division employs a staff of engineers who are also additives handling specialists, the "Operations Group." These men have had broad experience in their field. To pass their know-how along to you in the oil industry, we now issue, from time to time, "Additives Handling Bulletins."

THE NEW series of additives handling bulletins will be available to you in this convenient filing folder.

OVER

BASIC RESEARCH IS A NEVER-ENDING PROJECT AT DU PONT

Last year, the Du Pont Company spent approximately $15 million for *basic* research alone—research into unexplored spheres of chemistry.

The expenditure represents nearly 20% of the company's total investment, almost $80 million, in research and development. Last year marked the 30th anniversary of our basic research program, which has yielded new knowledge and eventually contributed to the development of many new Du Pont products. Among the fundamental research projects undertaken by the Du Pont Company back in 1927 was the work on condensation polymers. This work has since borne fruit by forming the scientific basis which led to such products as nylon, "Zytel" nylon resin, "Delrin" acetal resin, "Mylar" polyester film, and "Cronar" polyester film base. The long list of other products stemming from our basic research projects includes neoprene synthetic rubber, weed killers, and polyurethanes.

A pioneer

Du Pont has been one of the industrial pioneers in basic research. Back in 1927, virtually all industrial research was "practical," aiming directly at product discovery and development. Then came, in addition, the quest for more pure scientific knowledge.

Du Pont's belief in the importance of this work has caused basic research to become an immense, never-ending project for the company. Today, approximately 440 Du Pont scientists are engaged in this type of activity and, altogether, 2,170 are working exclusively on research and development projects.

Fundamental combustion research

The Petroleum Chemicals Division participates in this program through such research as our continuing fundamental combustion studies at the Du Pont Petroleum Laboratory. The results are made available to the petroleum industry in published papers.

One of our newer products, Fuel Oil Additive No. 2, is an outgrowth of polymer research conducted in the main Du Pont Experimental Station.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT *Petroleum Chemicals* NEWS

CONTINUED *Additives Handling*

The first of these has recently come off the press. It deals with the use of duplex pumps (instead of the simplex type) for keeping additives free-flowing in cold weather.

By using this type of pump, installed with the additives drum in a heated building or cabinet, the additive, with diluent, can be piped for a considerable distance outdoors in cold weather. Thus the necessity of either heating or insulating pipes is avoided.

A diagram shows clearly how the pump can be set up in a typical refinery treating system. Information on installation, applications, variations, advantages, and costs is included in the bulletin.

Future subjects

Other bulletins in the series which will be published shortly will discuss such subjects as methods of pumping, heating, dispensing, storage.

EACH BULLETIN WILL CONTAIN detailed data and diagrams on the additives handling aid featured.

There is no definite publication schedule. We plan to issue them as often as helpful ideas are developed. If you would like to receive copies, just get in touch with one of our representatives at any of the sales offices listed at the right.

See the "Du Pont Show of the Month" on CBS

HEADS UP EASTERN REGION

EARL G. BENNETT is Eastern Regional Manager for the Du Pont Petroleum Chemicals Division, with headquarters in New York City. Prior to this assignment, he was Central Regional Manager in Chicago.

Mr. Bennett has been with the Du Pont Company since 1931. His first job was in the Grasselli Chemicals Department. In 1934 he was transferred to a sales position in the Organic Chemicals Department.

In 1939 he went to Chicago in charge of sales in the Western area for the organization now known as the Petroleum Chemicals Division. He returned to Wilmington in 1943 as a member of our Petroleum Laboratory staff. He was appointed Central Regional Manager in 1947.

Mr. Bennett was graduated from Clarkson College of Technology with a B.S. degree in chemical engineering. He is a member of the American Chemical Society, the Society of Automotive Engineers, and the American Petroleum Institute.

When he recently took over the managership for the Eastern Region, he succeeded Mr. Alfred R. Mullis, who became assistant director of sales in Du Pont's home office, Wilmington. And Mr. Bennett was succeeded in the Central region managership by Mr. Donald W. Frison, formerly manager for Mid-Continent region in Tulsa.

To Reduce Treating Costs...

You can sweeten AND stabilize, both with a single additive

You can take both of these important steps in a single, inexpensive operation with one additive—Du Pont Antioxidant No. 22 (AO-22).

YOU CAN obtain copies of these booklets on antioxidant sweetening from any of our sales offices listed at right.

Antioxidant sweetening equipment is less expensive than other types. And no sulfur or copper is required – so there is no chance of contamination from these elements. Also, there is no loss of gasoline or octane number.

SALES OFFICES

Chicago 3—8 So. Michigan Ave. . . . RAndolph 6-8630
Cleveland 15—25 Prospect Ave. . . . SUperior 1-1363
Denver 2—Petroleum Club Building, 16th & Broadway . . . . . AComa 2-2347
Houston 2—705 Bank of Commerce Bldg. . . . . CApitol 5-1151
Los Angeles 17—612 So. Flower St. . MAdison 5-1691
New York 20—1270 Ave. of the Americas . . . COlumbus 5-2342
Philadelphia 2—3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . . EXbrook 2-6230
Seattle 3—4003 Aurora Ave. . . . . MElrose 6977
Tulsa 1—1811 So. Baltimore Ave. . . . LUther 5-5578
In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461
In Other Countries—Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., OLympia 4-5121, Ext. 2962.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living ... *through Chemistry*

Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

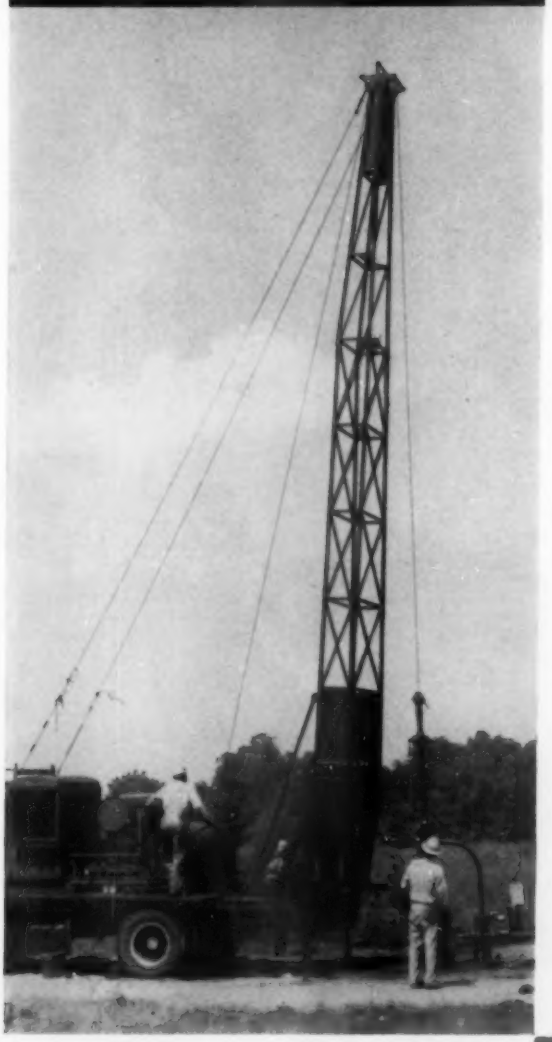
ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-6293

Printed in U. S. A.

CONTROLLED SWABBING

with Guiberson Swabs



When you're ready to unload or swab test your well, Guiberson fast-falling swabs will do your job at the lowest possible cost.

You get better control of swabbing costs through selection of proper cup size and type. You can match the cup to the situation . . deep or shallow wells . . light, medium or heavy loads . . smooth, rough or tight tubing.

You get maximum control of results, too, when you use the right cup for your particular job. Maybe that calls for lifting lots of fluid fast . . or lighter loads at slower speeds to protect a permeable sand face. One of the several types of Guiberson cups in a wide range of sizes will suit the circumstances and you can put the well on production quickly.

Lift more fluid in fewer trips with Guiberson's fast-falling, smooth-pulling swabs.

Cups are compounded to Guiberson's exclusive formulas for maximum balanced resistance to oil . . acid . . abrasion.

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

Drilling in Lake Maracaibo is The Offshore Company's new barge V-1. Barge V-2 is also working in this area. These units are the most powerful Diesel-electric rigs yet to work in Venezuela. Each is capable of drilling in excess of 12,000 feet.

The Offshore Company Goes to Venezuela

—picks Electro-Motive Power with overseas service and parts facilities for two new Diesel-electric barges

The Offshore Company, first to use Electro-Motive Power in the United States, is now first to use this Diesel-electric equipment in Venezuela on their new barges, V-1 and V-2.

Each of these modern barges contains Electro-Motive equipment of 2700 horsepower, making them the most powerful Diesel-electric rigs sent to work in the Lake Maracaibo area.

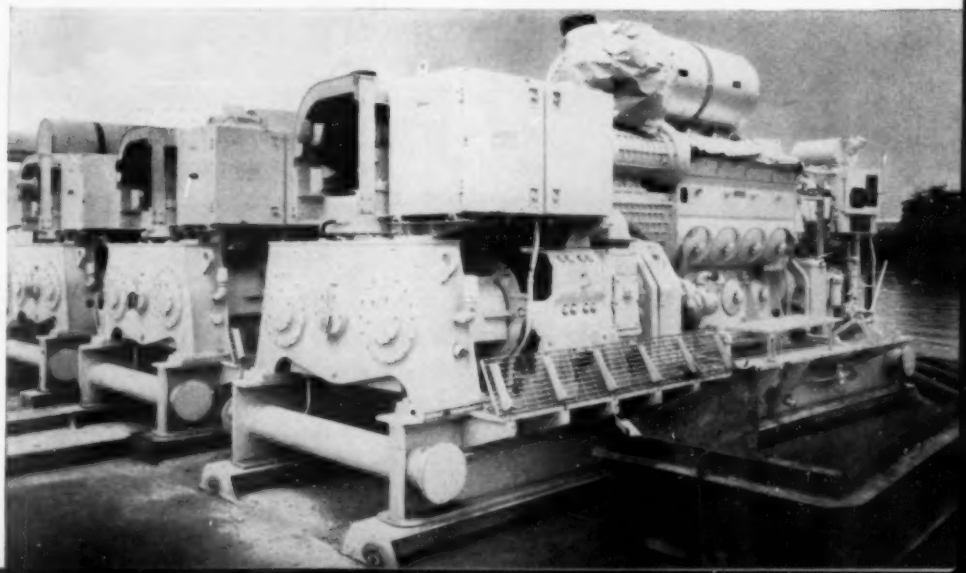
Behind The Offshore Company's choice of power for the new barges was experience with Electro-Motive Power on their record-breaking mobile platforms Nos. 54 and 55 and their fixed platform No. 25. But most important was the knowledge that they could get *local* service for Electro-Motive equipment from General Motors de Venezuela.

Factory-trained personnel head up this facility through General Motors Overseas Operations. It offers the same superior service for Electro-Motive equipment found in the Gulf. Here too, complete facilities are offered for both engine and electrical components—*one responsibility* for the complete power system.

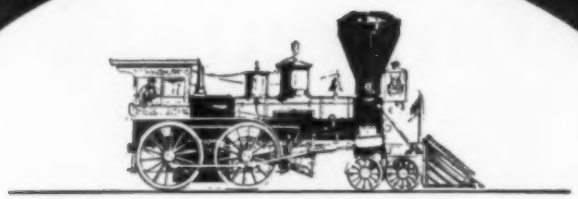
If your interests lie in moderate or deep drilling in this country, Canada, South America, or elsewhere, look into the advantages of Electro-Motive equipment with established world-wide service facilities. See your Electro-Motive representative for details.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · La Grange, Ill.

In Canada: General Motors Diesel Limited, London, Ontario
Petroleum industry sales offices: Dallas and Houston, Texas; Morgan City, Louisiana; Los Angeles, California.



Three Electro-Motive engine-generator sets of 900 hp each supply power to drive motors on mud pumps and draw works. These sets are heat-exchanger cooled. Sets are also available with air cooling or keel-cooling systems.

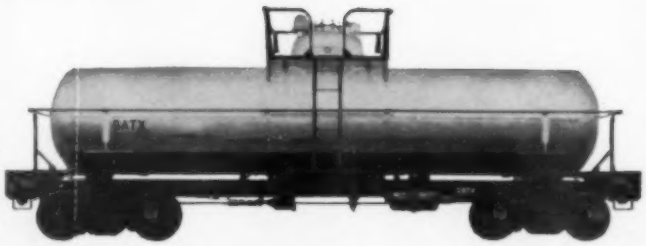


museum pieces are for museums

In 1869, this locomotive was the last word. Today, it is a museum piece.

Not so, your product. If it were, you'd be in the museum business or out of business entirely.

But, if you ship a liquid in bulk, what about the package—the car in which your product goes to market?



Packages are for selling—whether they are on a shelf or on a railway siding. Your product deserves the best package you can find for it.

If your product is a liquid shipped in bulk, GATX builds or can build just the package for it—a tank car that protects your shipment and promotes your good name.

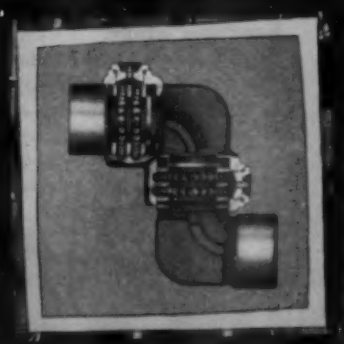
GATX operates the cars for you, knows where they are, keeps them on the move and maintains a nationwide network of shops for their service and upkeep.

No capital investment . . . no operating worries . . . when you ship GATX!

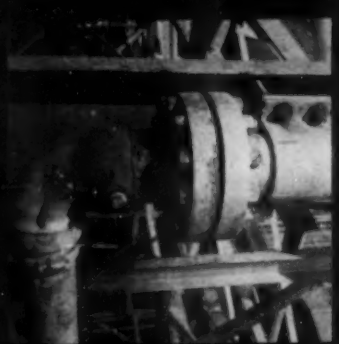
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street
Chicago 90, Illinois
Offices in principal cities

CHIKSAN HELPS UNION OIL CUT OUT THE COKE

Swiveling Chiksan Decoking Arms combine flexibility and stamina to handle 1700 psi hydraulic water force used to remove petroleum coke from coke drums



During refining of crude stock at Union Oil's Oleum refinery, petroleum coke is produced as a valuable by-product. When coke drums become full, they are "decoked" with a high pressure water jet which first drills out a pilot hole, then cuts the coke loose, moving it out of the tower in slurry form. Safety dictates all metal flexible lines. The solution—Chiksan Swivel-Jointed All Steel Decoking Arms. These rugged units provide free turning rotation with all movement carried out in a predetermined arc. Service life of the Chiksan Decoking Arms is measured in years and maintenance involves an occasional packing replacement. If your equipment or plant lines require flexibility, let Chiksan swivel joints provide the answer with less maintenance, limited replacements, and the safety that only steel can provide. Write today for literature and price lists.



LOOK INSIDE A SWIVEL JOINT. Detailed attention to detail. Precision machining and specific packing seals for specific services. These are the quality-plus features built into every Chiksan Swivel Joint.

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

fmc CHIKSAN

CHIKSAN

Please address DEPT. 31

CHIKSAN COMPANY—BREA, CALIFORNIA • CHICAGO 5, ILLINOIS • NEWARK 2, NEW JERSEY

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Company • Chiksan of Canada, Ltd.

#57-29

R. S. (Mister Cap) Barnwell of Barnwell Offshore, Inc., called on an independent Pittsburgh Steel Co. distributor for completely integrated service when this new offshore drilling barge was built—shown here on location. The independent distributor furnished everything above and below the barge deck connected with drilling. That's how he made a big contribution when . .

Mister Cap Sailed On Time

Mister Cap not only sailed on time but also set a record by requiring only 12 days from christening to bringing in an oil well.

And that included the time it took to move the rig some 40 miles out in the Gulf of Mexico in the Mississippi Delta area.

Back of that record was a story of an independent distributor's service. Here is that story:

Supplying *all* drilling equipment for a $4 million offshore barge is a big job for a single supplier—but a Pittsburgh Steel Company independent distributor did it with ease.

When Barnwell Offshore, Incorporated, of Shreveport, La., built the new "Mister Cap" drilling barge, Barnwell asked this independent distributor to supply everything above and below the barge deck connected with drilling operations.

Johnny Morgan, drilling engineer for an independent Pittsburgh Steel Co. distributor, left, confers with R. S. Barnwell Jr., president of Barnwell Offshore Drilling, Inc., on plans for the Mister Cap offshore drilling barge.

That included not only drill pipe, casing and tubing but also the mast and draw works, the pumps, the Diesel-electric equipment, pressure vessels, the valves and fittings and even the pipe usually supplied by shipbuilders who fabricate barges.

The independent distributor was able to do a "lock, stock and barrel" job because of the wide range of services and facilities he offers customers.

Equipped with a Fabricating Division, Machine Shop, Welding Shop, Threading Department, Compressor Department and a Service and Parts Department, this independent distributor is hard to beat for a completely integrated service.

Although not every independent distributor has this line-up of facilities, it is typical of the service independents offer oil country customers.

V. J. (Vic) Martzell, vice president of the independent which did the big job for Mister Cap, says:

"We stay in business because we can make quicker decisions and because we're willing to get more sand in our shoes.

"Around here it's routine to keep close track of our customers' drilling operations and to make sure drillers get pipe and equipment they need when they want it without loss of rig time."

When you're paying around $1,000 a day for operating a land rig and as much as $8,000 a day to operate an offshore rig, you appreciate a supplier who can get you the pipe and equipment you need within hours.

All the independent distributors han-

dling Pittsburgh Steel products in the oil country operate that way. That's the key to their success . . . service.

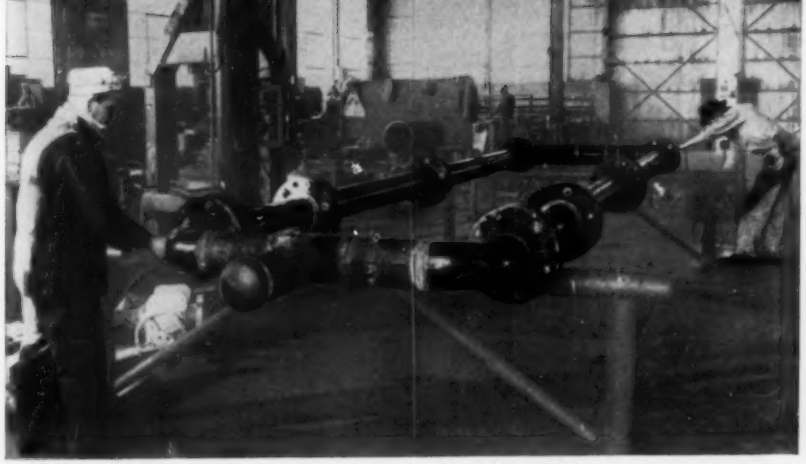
This service continues long after the order has been filled. On the Mister Cap, for example, representatives from the closest of the distributor's twelve stores can be in constant contact with the superintendent in order that his every need may be fulfilled in a minimum amount of time.

Wherever you are operating, you'll find the store of a Pittsburgh Steel independent distributor handy. There are more than 140 such stores scattered through the oil fields.

Independent distributors are ready for action—sales action. Their well-stocked stores make the best and latest equipment available 24 hours a day, seven days a week. Independents' service is flexible, free of unnecessary paper work and red tape delays. Independents are fully competitive because their costs are low. A local businessman—familiar with local business people and local business problems—the independent distributor is in his community to stay. He knows his success is related directly to selling quality products and providing unmatched service. That's why the independent distributor selects Pittsburgh Steel's Seamless Oil Country goods. And it's why you can rely on all the independents listed here.

When you need a string of drill pipe, casing or tubing, call one of these independent distributors.

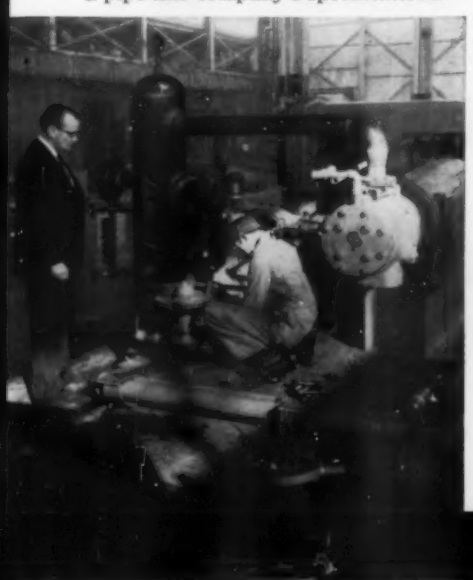
You'll do better with the pipe of your choice bought from the distributor of your choice.



A gas measuring station for a natural gas line is prepared for hydrostatic testing in the distributor's large, well equipped Fabricating Division.

Adequate field stocks of Pittsburgh Steel tubing enable this Louisiana distributor to serve his customers adequately and quickly.

Thomas C. Poindexter, vice president and manager of the distributor's Fabricating Division, checks up on the assembly of a compressor unit built to a pipe line company's specifications.



Distributor Home Offices

Bradford Supply Company Bradford, Pennsylvania	**Iverson Supply Company** Tulsa, Oklahoma	**Murray Brooks, Incorporated** Lake Charles, Louisiana
Buckeye Supply Company Zanesville, Ohio	**Longhorn Supply Co., Inc.** Houston 14, Texas	**The Producers Supply & Tool Co.** Fort Worth 2, Texas
Cardwell Manufacturing Co. Wichita, Kansas	**Lucey Export Corporation** New York 7, New York	**Production & Refining Equipment Company** Odessa, Texas
C. W. Cotton Supply Company Tulsa 5, Oklahoma	**Lucey Products Corporation** Tulsa 19, Oklahoma	**Sandy Supply Company** Wooster, Ohio
Franklin Supply Company Chicago 5, Illinois	**McJunkin Corporation** Charleston 22, West Virginia	**Southwest Supply Company** Pittsburgh, Pennsylvania
Houston Oil Field Material Co. Houston, Texas	**Midland Supply Company** Wichita 7, Kansas	**Superior Iron Works & Supply Co.** Shreveport, Louisiana
Industrial Supply Company Wichita Falls, Texas	**Mountain Iron & Supply Co.** Wichita 2, Kansas	**Western Supply Company** Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

Millions of tiny fingers stop fluid loss

. . . thousands of feet below!

For deep-down fracturing there's nothing more effective against fluid loss than Adomite! Its millions of tiny particles act like small fingers which seal the fracture face . . . without damage to the formation. In sharp contrast to other fluid additives, Adomite retains its stability under the greatest range of pressures and temperatures.

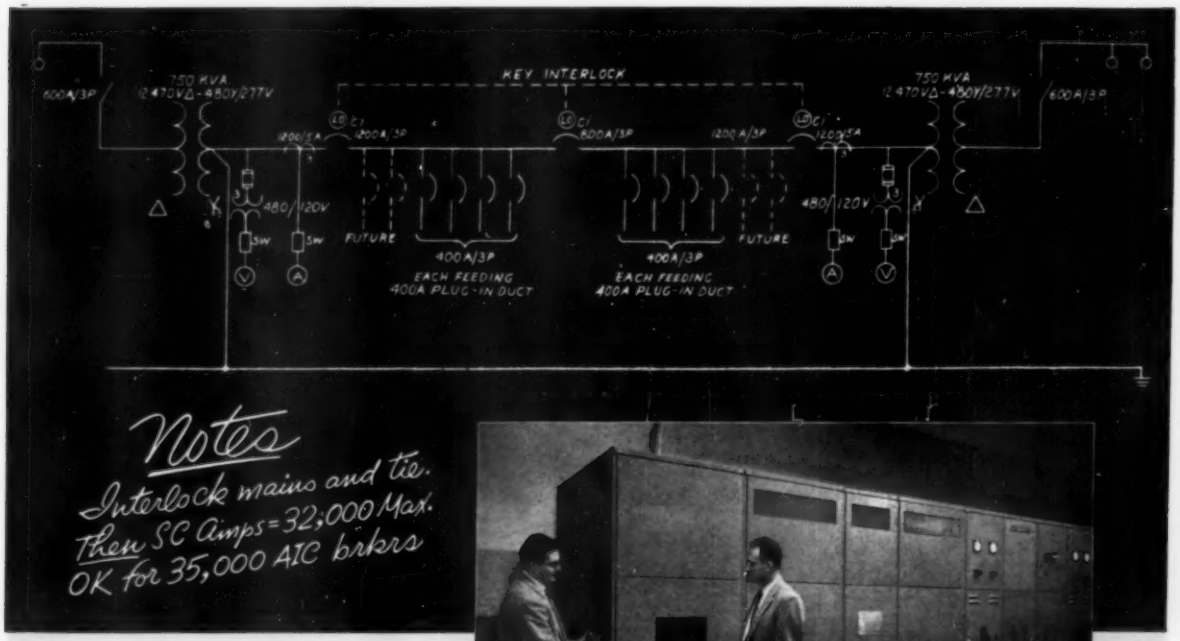
Adomite works with maximum effectiveness because it allows deeper penetration of sands . . . helps prevent sandouts . . . and is all you need to control fluid loss of kerosene, crudes, gelled crudes or refinery residuals.

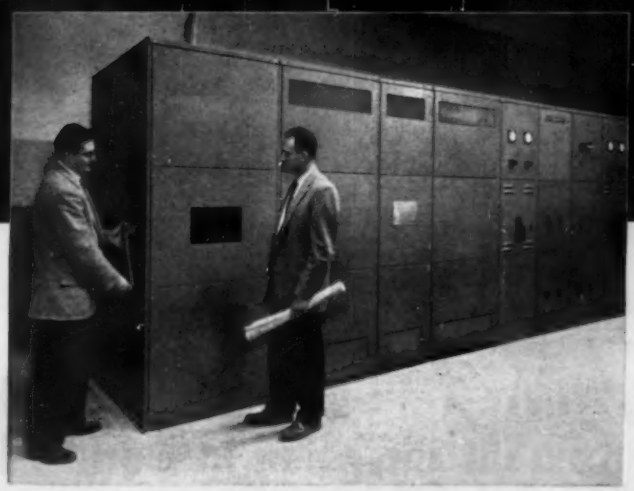
Note these other benefits and you'll see why more and more producers are *standardizing on Adomite:*

- Reduces fluid loss in rock matrix; prevents build-up of sand concentrations in the fractures.
- Permits higher injection rates and greater treating pressures . . . Adomite fracturing fluids have lower viscosity than viscous refinery residuals.
- Leaves no permanent seal on fracture wall . . . no evidence that formation has ever been plugged after treatment.

© 1958, Continental Oil Company

For greater profits . . . fracture with ADOMITE®





In Unit Substations COORDINATED DESIGN

Cuts Costs and Saves Space!

Square D designs and builds a complete line of substations for any application, indoor or outdoor—with dry or liquid-filled transformers—with large air breakers or molded case breakers—with motor control units.

A typical example is this 1500 KVA double-ended unit substation, designed to meet the special requirements of a Lexington, Kentucky, plant. Flexibility for future expansion and complete safety without service interruption were essential. The following features are incorporated in the unit:

Main breakers are 1200-ampere air circuit breakers

Feeder breakers used to feed Square D plug-in duct, are molded case breakers

Tie-in breaker is key-interlocked to permit tying units together when operating on one transformer in an emergency

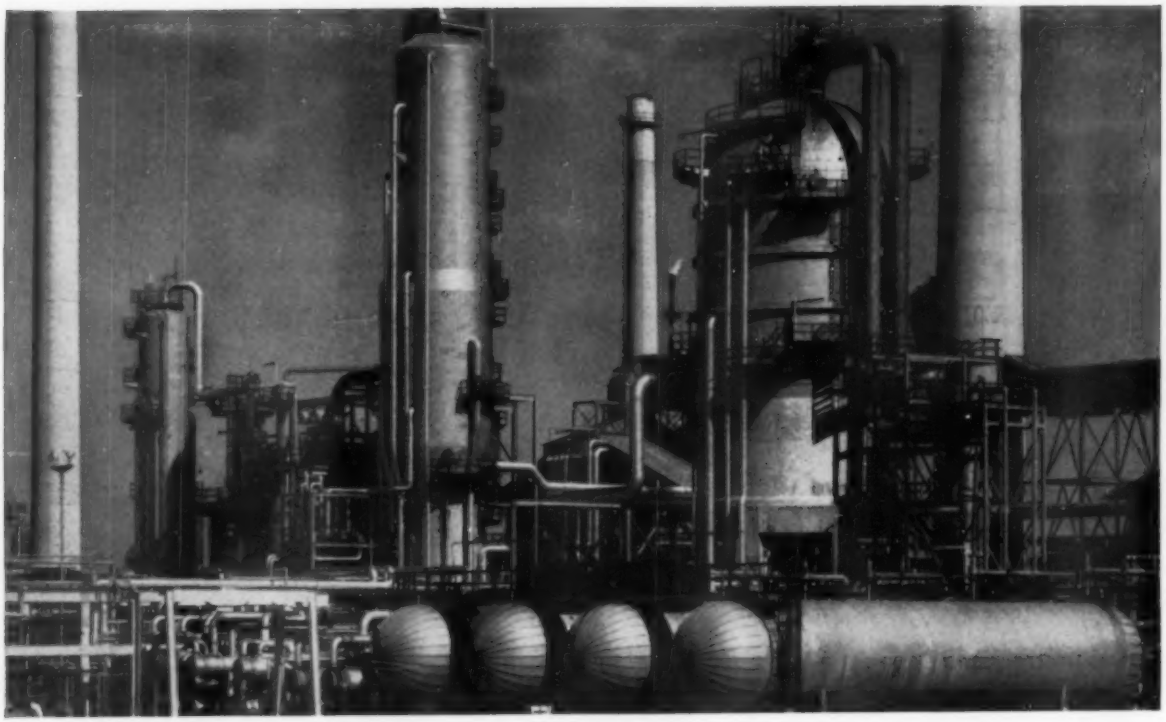
Interrupting capacity of all molded case breakers exceeds the total maximum available short circuit current, including 100% motor contribution

By the proper application of molded case breakers, Square D engineers achieved a substantial reduction in both the size and the cost of the substation—and with no sacrifice in performance.

For the complete story of Square D coordinated design, write Square D Company, 6060 Rivard Street, Department SA, Detroit 11, Michigan.

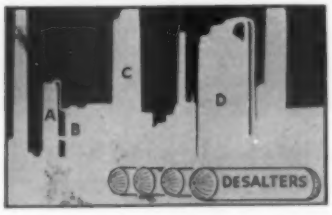
EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY



The new Delaware Refinery . . .

Where Tidewater placed high nickel alloys to combat corrosion in world's largest crude unit



This is the crude unit . . . world's largest . . . in the ultra-modern Delaware Refinery.

It's the last word in corrosion protection. In engineering this protection, The Tidewater Oil Company and C. F. Braun & Co. took full advantage of high nickel alloys. In general, they used these materials to combat corrosion by dilute mineral acids and by the sulfur and naphthenic contents of the feeds. The schedule below gives details.

For further information . . . for help in your own corrosion prevention engineering . . . write Inco's Development and Research Division.

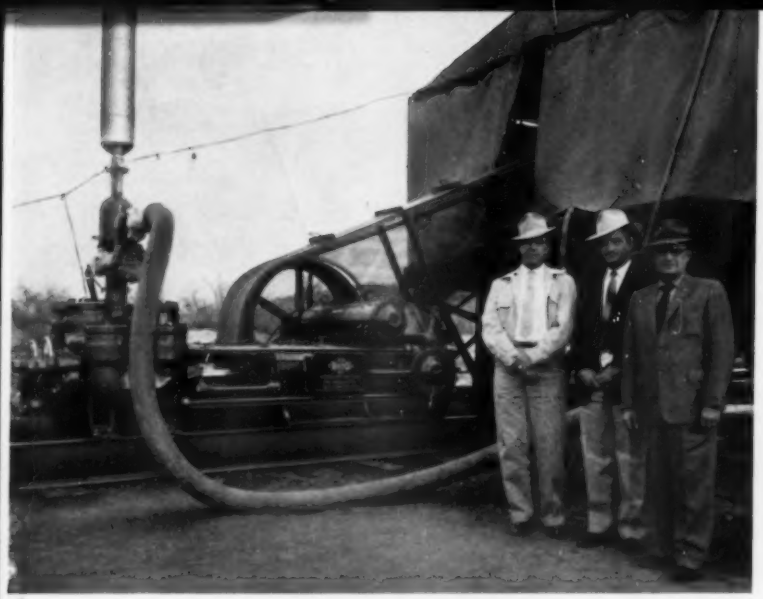
The International Nickel Company, Inc.
67 Wall Street INCO New York 5, N. Y.

Schedule of high nickel alloy use* in the crude unit at Delaware Refinery

Key	Equipment	Location	Principal Corrosives	Material
A	Gasoline Col.	Shell and trays above tray 13	H_2S, aqueous HCl	Monel alloy
		Nozzle sleeves in OH accum.	H_2S, aqueous HCl	Monel
		Water draw pot	H_2S, aqueous HCl	Monel-clad steel
		Foul water pump	H_2S, aqueous HCl	Monel alloy
		OH-to-receiver piping	H_2S, aqueous HCl	Monel alloy
B	Gasoline Stab.	Shell and trays above tray 7	H_2S, aqueous HCl	Monel alloy
		Shell and trays below tray 8	Naphthenic acid	Inconel alloy
		Nozzle sleeves in OH accum.	H_2S, aqueous HCl	Monel
		Reboiler tubes, sheets, flohead	Naphthenic acid	Inconel alloy
		Reboiler shell	Naphthenic acid	Inconel-clad steel
		OH-to-receiver piping	H_2S, aqueous HCl	Monel alloy
		Reboiler liquid and vapor piping	Naphthenic acid	Inconel alloy
C	Atmospheric Col.	Foul condensate pump	H_2S, aqueous HCl	Monel alloy
D	Vacuum Col.	Condensate pump bowls and impellers (1st, 2nd, and 3rd stage)	H_2S, aqueous HCl	Monel alloy
All — elements		Foul condensate pumps	H_2S, aqueous HCl	Monel alloy

*Where temperatures go above 500°F. nickel-containing Type 316 stainless and stainless-clad steel is also extensively used in this unit.

INCO NICKEL ALLOYS



"This pump's performance was so satisfactory . . . bought a new (Wheland) HP-8000 pump for the smaller rig."

—J. W. Hastings

Here's the dependable Wheland HP-14000, still doing a fine job after 5 years in the field. Standing left to right, are Mr. J. W. Hastings, Owner; Mr. C. T. Coffman, Drilling Supt.; Mr. Joe Don Carlos, Wheland Representative.

J. W. HASTINGS
DRILLING CONTRACTOR
720-722 WICHITA NATIONAL BANK BUILDING
WICHITA FALLS, TEXAS

April 15, 1957

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

I purchased one of your HP-14000 pumps five years ago which has cut a tremendous amount of hole with virtually no repair expense.

This pump's performance was so satisfactory that when I began acquiring new machinery, bought a new HP-8000 pump for the smaller rig.

Both of these pumps are still in operation and doing a satisfactory job.

I operate two rigs in North Texas area. We drill contracts, interest deals and for our own account, from 2,000 - 8,500 feet.

Yours very truly,

J. W. HASTINGS DRILLING COMPANY

J. W. Hastings

FIRST PUMP'S RECORD SOLD THE SECOND!

5-YEAR RECORD

OF OUTSTANDING PERFORMANCE

"virtually no repair expense"

—J. W. Hastings

WHELAND HP-14000

7½" x 14" DUPLEX SLUSH PUMP

350 Horsepower Nominal Input at 60 RPM
Discharge pressure with 7½" liners 838 PSI
Discharge pressure with 5½" liners 1627 PSI
Dependable Operation • Lower Maintenance
Delivers more pressure per pound of pump!

Write for Detailed Bulletins

WHELAND

ROTARY DRILLING MACHINERY

THE WHELAND COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.

DRAW WORKS • SLUSH PUMPS • ROTARIES
CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas • JONES AND LAUGHLIN STEEL CORPORATION, SUPPLY DIVISION—Main Office: Drawer 2481, Tulsa 2, Oklahoma.

EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

ALUMINUM

...to fight Maracaibo's corrosion
...to slash rig installation cost

Sink a piece of steel into Lake Maracaibo's corrosive waters, and you won't have much of that steel left after a short time. The high oxygen content of that oil-rich lake chews ferrous metals to pieces.

Which is why the new *aluminum* offshore drilling structures are so important to the oil men working Lake Maracaibo. Developed by J. Ray McDermott, offshore contractor, and Reynolds Metals Company, these tough aluminum templates stand up against corrosion as much as *9 times* longer than steel.

And they save plenty in installation time and costs. The lightweight prefab structures are installed in *two days* by McDermott—compared with as much as 25 days installation time required for the concrete pilings they replace.

The Maracaibo story is just one more in a long list of cost-saving jobs Reynolds Aluminum is doing in the petroleum and chemical processing industry. Reynolds Aluminum is lowering maintenance, installation, replacement and production costs in process pipe, heat exchangers, jacketing, tanks and vessels, drilling rigs, oil country pipe, tubing, structurals.

All-welded for strength

The Reynolds Aluminum jackets for the new Maracaibo drilling platform have welded joints, with special extruded aluminum saddles for added strength and rigidity. These are the largest all-welded aluminum structures ever built.

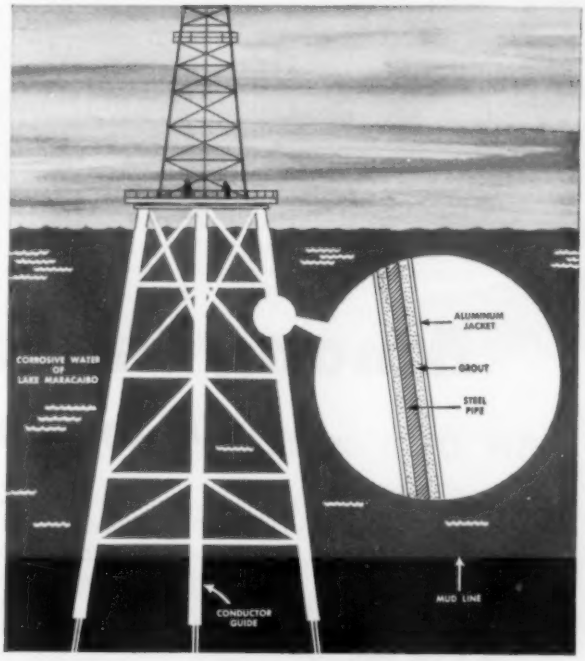
Conductor pipe: guarded by aluminum

Corrosion—the big obstacle to drilling in Lake Maracaibo—is no problem with the high-strength corrosion-resistant Reynolds Aluminum jackets. Aluminum protects this steel conductor pipe (to contain well casing and drill pipe) from corrosion.

Solves corrosion, relocation problems

This platform design, using tough lightweight Reynolds Aluminum, solves two big problems: Corrosion and installation. Eliminating concrete piling supports, these platforms can be installed in two days—and moved to new locations at great savings.

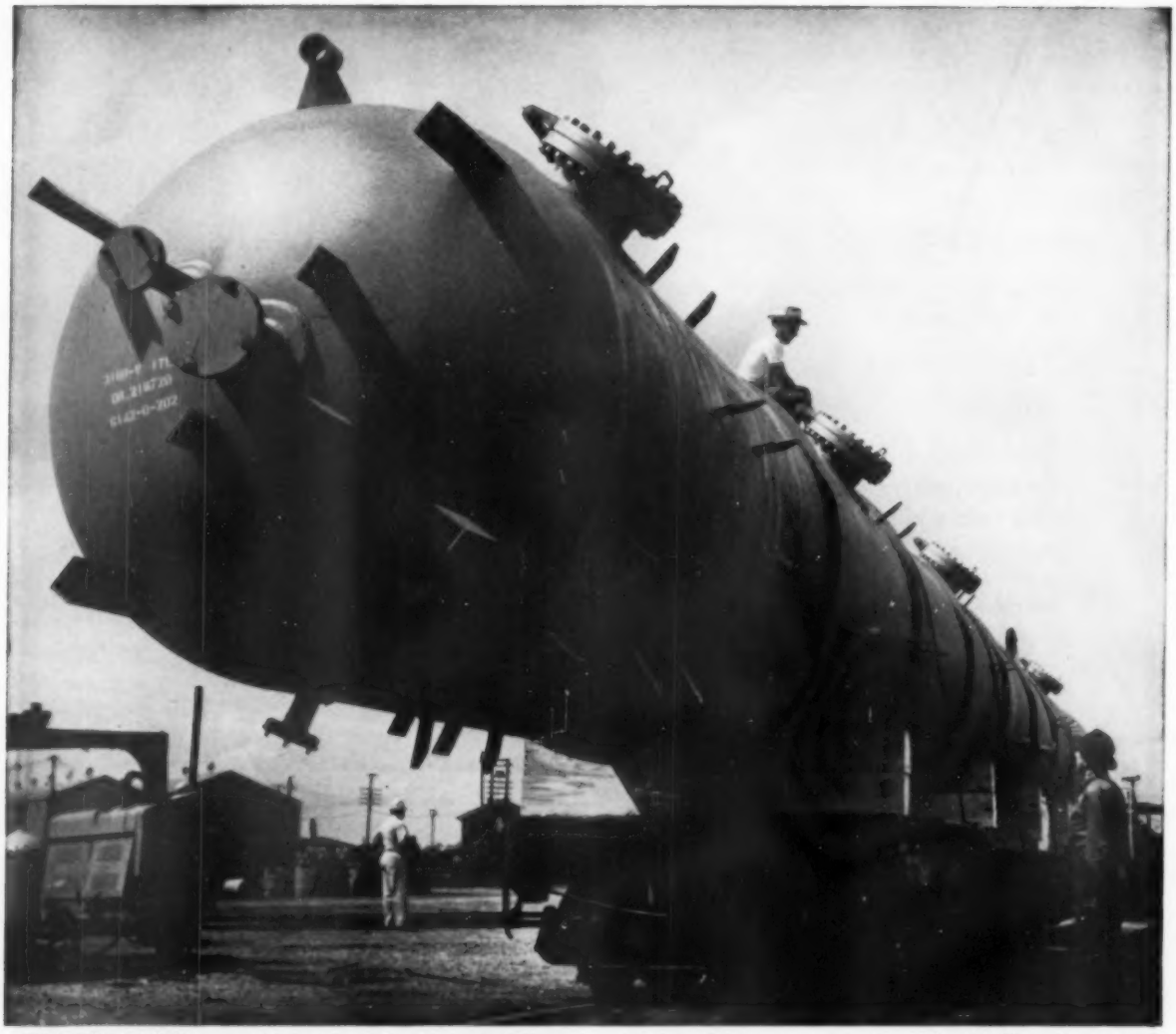
For details on how Reynolds Aluminum can be put to work for you, and for technical help, call your local Reynolds office, or write direct: Reynolds Metals Company, P. O. Box 1800-CR Louisville 1, Kentucky; International Division, 19 East 47th Street, New York 17, New York.



The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

REYNOLDS ALUMINUM

Watch Reynolds All-Family Television Program "DISNEYLAND," ABC-TV.



THIS ENTIRE VESSEL was radiographed. Built for use by Socony Mobil Oil Company, Incorporated, it was stress relieved in thirds, and the two joints were stress relieved locally. The unit contains 30 uniflex trays of 96" diameter. Overall weight: 152,000 lbs.

Among the largest in use

...built by Newport News

This Debutanizer with a 110 feet 6 inches over-all length is typical of units that are readily built by Newport News . . .

In fact, Newport News can fabricate almost any type of pressure vessel or other heavy equipment used in the petroleum, chemical or other processing industries.

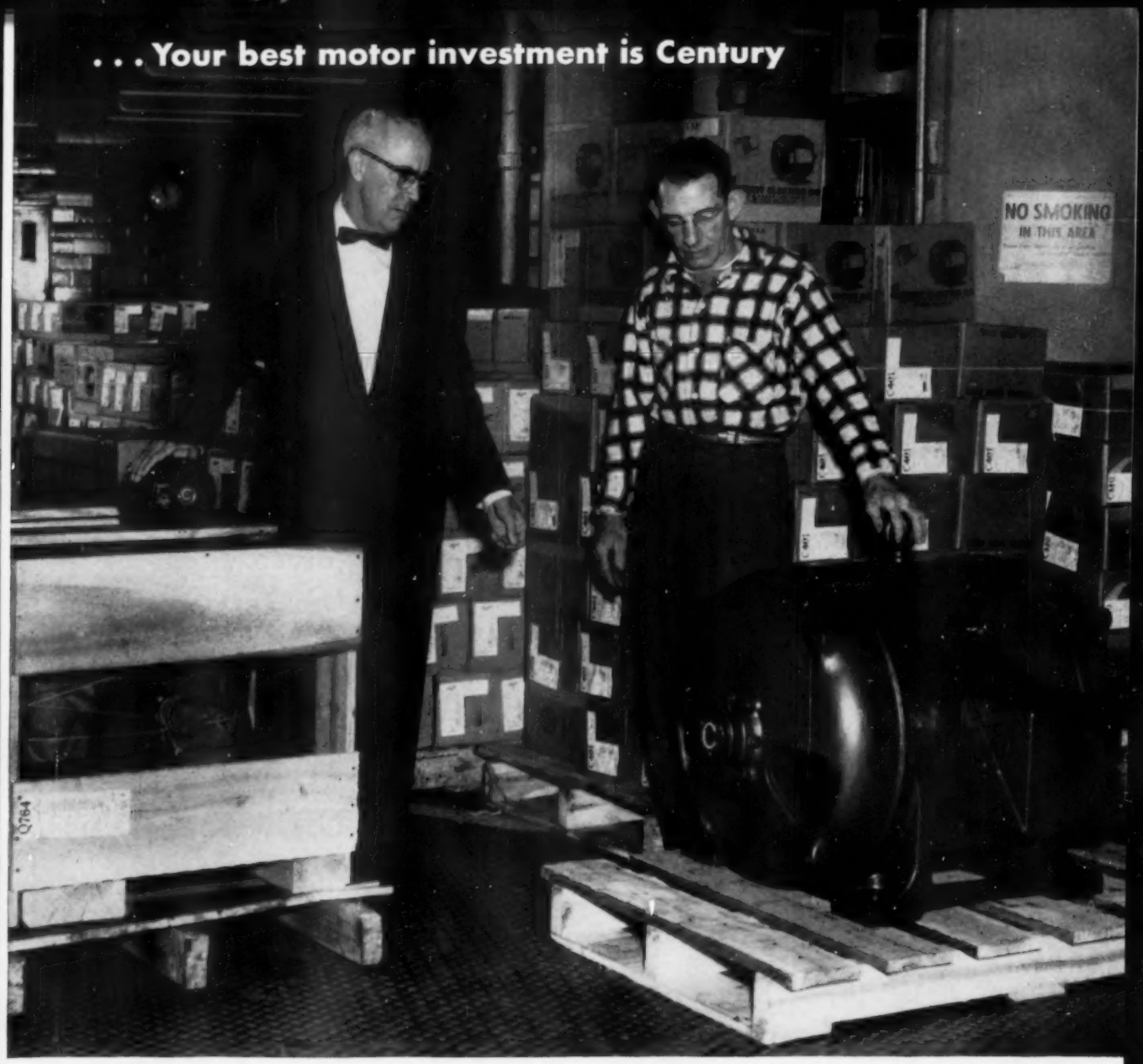
But at Newport News you'll find more than large productive capacity.

In vast fabricating shops, in huge machine shops, foundries and forging plants, Newport News craftsmen complete your order with specialized techniques. Plant methods . . . developed as a result of specializing for more than half a century . . . enable Newport News to provide money-saving answers to all sorts of heavy equipment problems.

Newport News craftsmen handle the job exactly as you want it done . . . for maximum results per dollar invested. So let us bid on your present or future projects. Learn how Newport News can help you. Send for our illustrated booklet entitled, "Facilities and Products"...it's yours for the asking.

Engineers – Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News Shipbuilding and Dry Dock Company
Newport News, Virginia



Top performers . . . big as 400 HP, small as 1/20 HP

Don't buy less motor than you need, nor more motor than you'll use. Specify Century . . . get exactly the right motors for your applications. Here's the *complete* line! An exceptionally wide range of types and sizes . . . all *top* performers.

Because they can be so carefully matched to your drive requirements, rugged Century motors give you even longer, more efficient service. And it's in the *long run*, especially, that your motor investment really pays off.

At Century you have a unified source and production capacity for all your electric motors up to 400 HP. Backed by *nationwide* supply and engineering service. Call your local Century man or Authorized Century Distributor.

Century MOTORS

CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

MOST VERSATILE NEW SERVICING

CARDWELL MODEL A-150 AND A-151

DOUBLE DRUM HOISTS

with optional spudding or rotating drive

Here are the most efficient servicing units in the lightweight class — to date! Model A-150 is powered by a rugged oil-field-type engine, and Model A-151 features PTO drive from truck engine.

Both of these versatile double-drum hoist units are rated to 5,000 feet servicing with 2½-inch tubing, but have been operated on occasion at greater depths. Both will spool 11,000 feet of ½-inch swab line. Either unit can be used for rotary drilling to 2,500 feet with 3½-inch drill pipe.

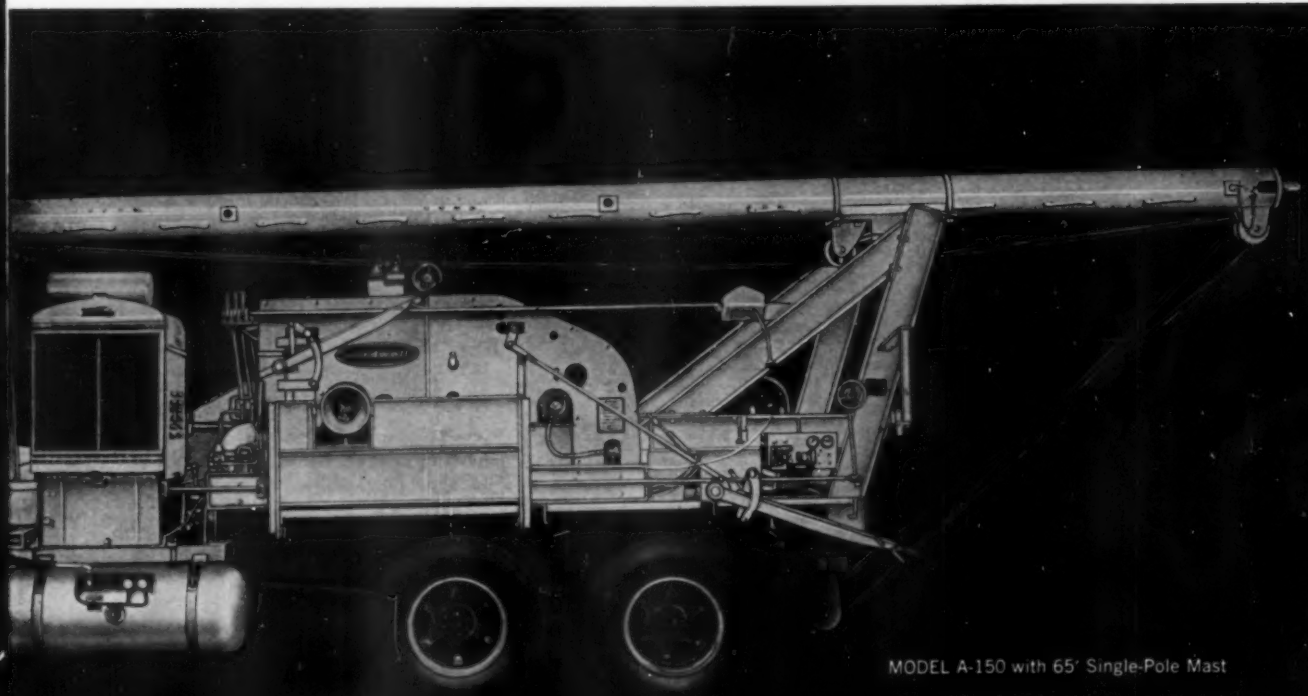
Nominal input is 120 HP, with five forward and one reverse speeds to hoisting drum, sand line drum, and rotary drive.

Increased versatility is obtained when these new Cardwell units are used with Cardwell's structural masts. Masts are equipped with outriggers to eliminate ground guy lines, and are prepared for hanging rods and standing tubing.

These new servicing units are just two of many new achievements Cardwell has planned for the industry in 1958. FOR **TOMORROW'S** EQUIPMENT... KEEP YOUR EYE ON CARDWELL — **TODAY!**

ADAPTABLE TO ANY OF THESE CARDWELL MASTS

UNITS IN THE FIELD TODAY!



MODEL A-150 with 65′ Single-Pole Mast

MODEL A-151 with
65′ Single-Pole Mast

55-foot Single-Pole Mast
55-foot Double-Pole Mast
65-foot Single-Pole Mast
65-foot Double-Pole Mast
50-foot Non-Telescoping Structural Mast
65-foot Telescoping Structural Mast

STAND-OUT FEATURES!

- Cardwell "Flex-Disc" air clutches for main and sand line drums.
- Safety-designed controls optional between skid level and ground level.
- Both main and sand line drums have two self-energized full-wrap brakes with single-point adjustment.
- Will accommodate most Cardwell single- or double-leg pipe masts and structural masts.
- Model A-150 engine driven with torque converter optional.
- Model A-151 drives from truck engine with power take off. Torque converter optional.

FOR FULL INFORMATION, CALL YOUR NEAREST CARDWELL REPRESENTATIVE

cardwell MANUFACTURING COMPANY

BOX 2001, WICHITA, KANSAS, U. S. A.

Here's **positive protection** against gas pilot failure

This sketch shows Partlow Safety Gas Valve, Model 760, in a typical piping layout.

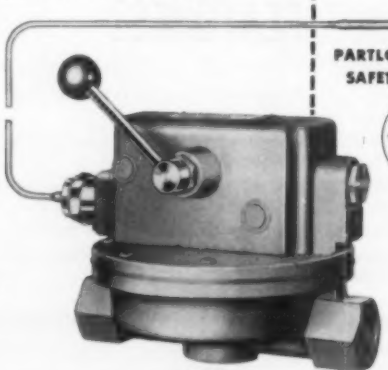
The Partlow Safety Gas Valve is ideally suited to oil field applications. *It's thermally operated . . . requires no electrical connections.*

This combustion safeguard gives positive protection to gas-fired appliances . . . prevents damage from gas pilot failure.

Rugged valve opens only after mercury actuated element becomes red hot from contact with pilot flame. If pilot goes out, element cools and releases a latch, causing valve to snap shut.

No conventional slip stem to corrode and stick. Strong perforated diaphragm guides valve disc to its seat.

PARTLOW MODEL 760 SAFETY GAS VALVE



WRITE TODAY FOR BULLETIN NO. 741

THE PARTLOW CORP.
Dept. G-358.
NEW HARTFORD, N. Y.

partlow

the pioneer in mercury thermal controls

Offices in All Principal Cities

They Say-

Journal Study Draws Comment

Reserves article "splendid"

Dear Sir:

"A Study of the Future Productive Capacity and Probable Reserves of the U. S." (OGJ, Feb. 24, p. 105) is much appreciated. The heads of our geological and engineering departments have read this paper and they agree with me that it is one of the most thought-provoking and timely articles on the subject ever written.

The background statistics used cannot be disputed, and the feature of looking at the barrels of reserves per foot of hole drilled stands out like a lighthouse on the New England Coast. Perhaps if all independent operators would read this, study it and digest it, they would not go over the deep end so often and subsequently blame outside influence for a lot of their troubles.

My sincerest congratulations and appreciation to Mr. Warren Davis and those who advised with him on writing this splendid paper.

M. M. Miller
Senior Vice President
Cosden Petroleum Corp.
Big Spring, Tex.

Valuable for forecasting

Dear Sir:

Kindly send one reprint of "A Study of the Future Productive Capacity and Probable Reserves of the U. S." This is a most excellent technical and economic study and should prove of value in long-range forecasting and planning.

R. C. Bernard, Jr.
Shelley Filter Co.
Licensed Professional Engineers
New Orleans

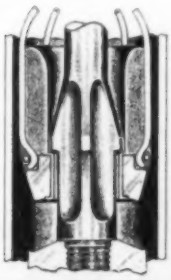
Prices or imports will rise

Dear Sir:

The article by Warren Davis appearing in the February 24, 1958, issue of The Oil and Gas Journal appears to be a very clear and carefully worked out procedure to evaluate the future potentialities of the United States from a standpoint of oil and gas reserves and the economic

FIRST REAL SWAB ADVANCEMENT IN YEARS

The development of the Oil States mandrel and swab cups has given the industry one of the *greatest swabs ever to hit the market.* Operators everywhere find the Oil States Swab Cups last longer and pull a bigger load. They say they can really make money with an Oil States Swab.



Cup position when going into hole.

Fig. 1

OIL STATES SWAB CUPS
The free pivoting wire, as shown in Figs. 1 and 2, allows the cup to respond to the lightest loads and, at the same time, lift the heaviest loads — NO BENDING OF WIRES REQUIRED!

Cup position when coming out of hole under load.

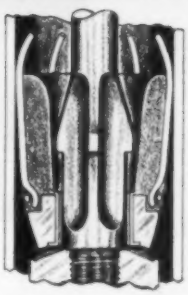


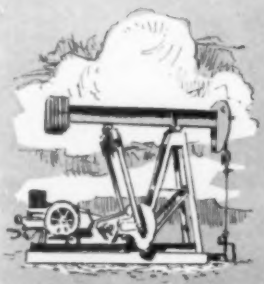
Fig. 2

OPERATORS EVERYWHERE ARE SWITCHING TO OIL STATES SWABS

Oil States

OIL STATES RUBBER CO.
ARLINGTON, TEXAS

INDUSTRY LOANS



PRODUCTION LOANS

DEVELOPMENT LOANS

EXPANSION LOANS

Oil Men Call Us "Bankers".....but

BANKERS CALL US "OIL MEN"!!!

One of the largest Oil Credit files in the U. S. Let us prove that "in oil matters it pays to Think . . . FIRST"

COMPLETE ENGINEERING AND OIL DEPARTMENT

W. L. KENDALL — Vice Pres.
M. R. BILLINGTON — Ass't Vice Pres.
W. L. MORRIS — Engineer
A. D. McCALL — Engineer

IN OIL MATTERS — *IT PAYS TO* . . .

Think 1st of Tulsa

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SINCE 1895

Member Federal Deposit Ins. Corp.

SURE... Reed offers you in tool joints, but only one

IN REED TOOL JOINTS, YOU MAY SELECT...

Select any type, but be sure it's REED !

Many factors are important in tool joint selection—whether your rig is readily accessible or isolated, the hole size and depths to be run, the chemical properties of formations and drilling fluids, services to be performed and tools to be used, hydraulic facilities, and even crew experience. You must decide which tool joints to use under your specific drilling conditions.

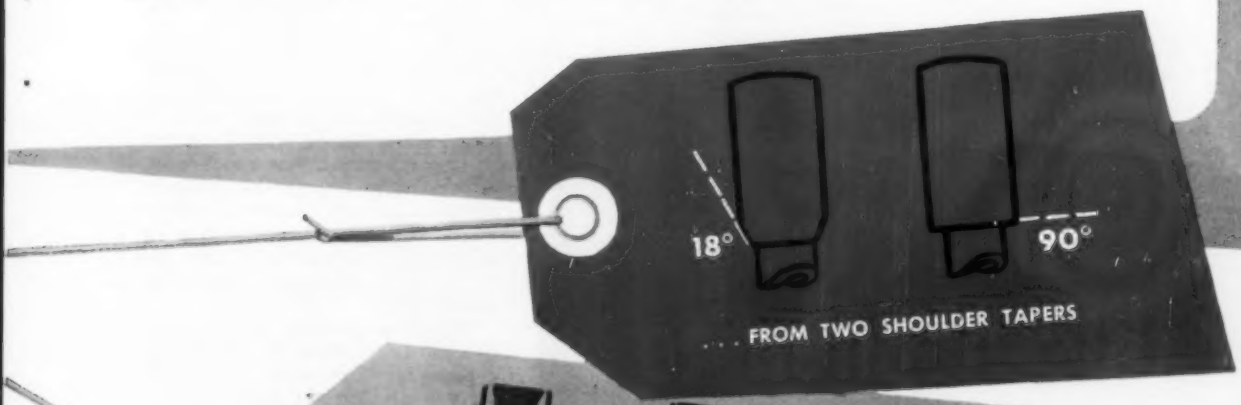
Here again, Reed's more than 30 years' experience in tool joint manufacturing can be helpful. Let this cumulative experience assist you in any phase of tool joint selection, care or application. Contact the Reed man anytime!

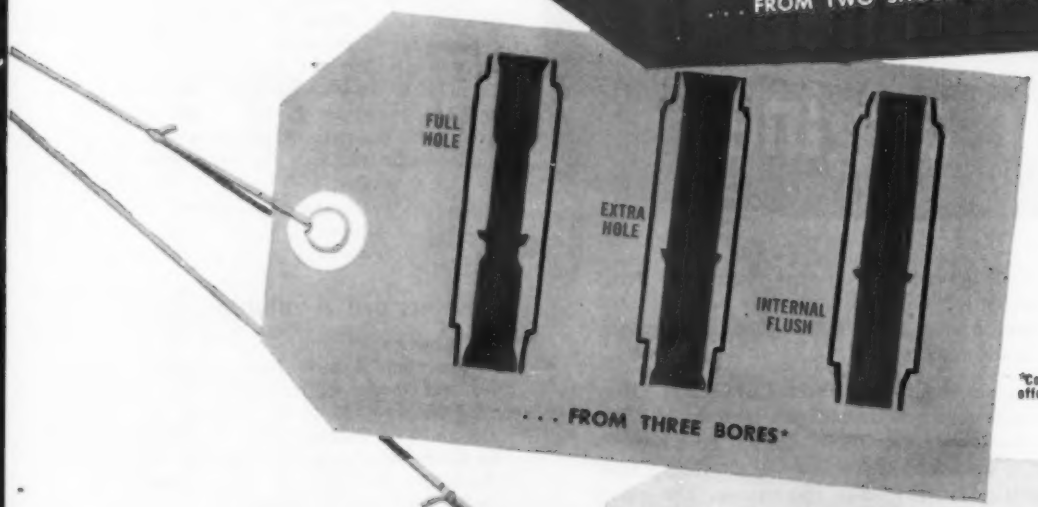
Research and engineering development maintain REED leadership

Write or wire for complete information . . . or have your Reed man explain the economical

Does Reed make a Super Shrink-Grip tool joint with 18° shoulders?

every type and combination quality... the very best!





*Counterbore Weld tool joints are offered also in A.P.I. Regular bore.

REED

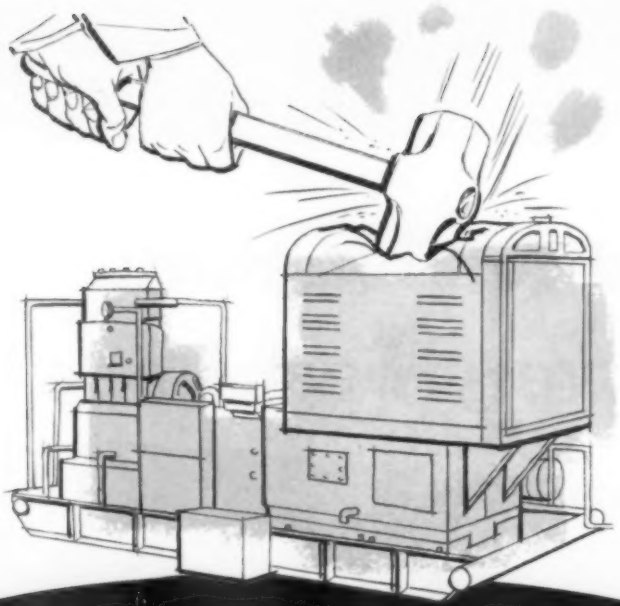
ROLLER BIT COMPANY

HOUSTON 1, TEXAS

in tool joint design.

and engineering advantages of Reed Tool Joints. Reed Roller Bit Company, Houston, Texas.

†Increased production facilities now permit Reed to offer Inarclad on all three—Flash Welded, Super Shrink-Grip, and Counterbore Weld tool joints!



Don't let this happen to your engines

No one will swing a sledge hammer on your engine *but* here's something just as destructive. Oil pressure failure or overheated cooling water can develop even in the best engine . . . and create serious damage and costly repairs!

That's why *your* engines should be protected by PENN Safety Controls. Then, if water temperature becomes overheated . . . or if oil pressure falls too low . . . the PENN control goes into action! Automatically, it sounds an alarm, flashes a warning light or stops engine operation . . . whichever you choose. The minor trouble then can be investigated and corrected before serious damage develops.

Learn more about this *low-cost* protection for *new and old engines.* Ask your jobber or write to Penn Controls, Inc., Goshen, Indiana.

PENN CONTROLS, INC. Goshen, Indiana

EXPORT DIVISION: 27 E. 38th ST., NEW YORK, N. Y.

AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

factors which influence their development.

It does, however, point out that the economics of exploration, developing properties, and the transportation to refineries must be vastly improved in the future if we are going to be able to continue to obtain a large share of our oil needs from this continent. Summing that up means, from the standpoint of the cost of doing the above things, the price of the end product must be raised or in the not too distant future it will be domestically unprofitable to search for, develop, and transport oil for our refineries.

The law of supply and demand, on the other hand, is making itself felt and if the over-all economics of the country will not stand for increasing of the price of domestic crude, then we will have to make way for substantial additional crude from foreign sources, which are much more prolific, on an average, than our own resources in the continental United States. This will help maintain more economical product prices for the benefit of the millions of users in the United States.

Regardless of which way the solution of this problem is handled, the demand for oil products in this country will not decrease in the foreseeable future. We are a nation on wheels and our homes are heated by oil or gas in the majority of instances. No known substance can do these jobs as well at present.

An Oil and Gas Journal
Reader
Pittsburgh

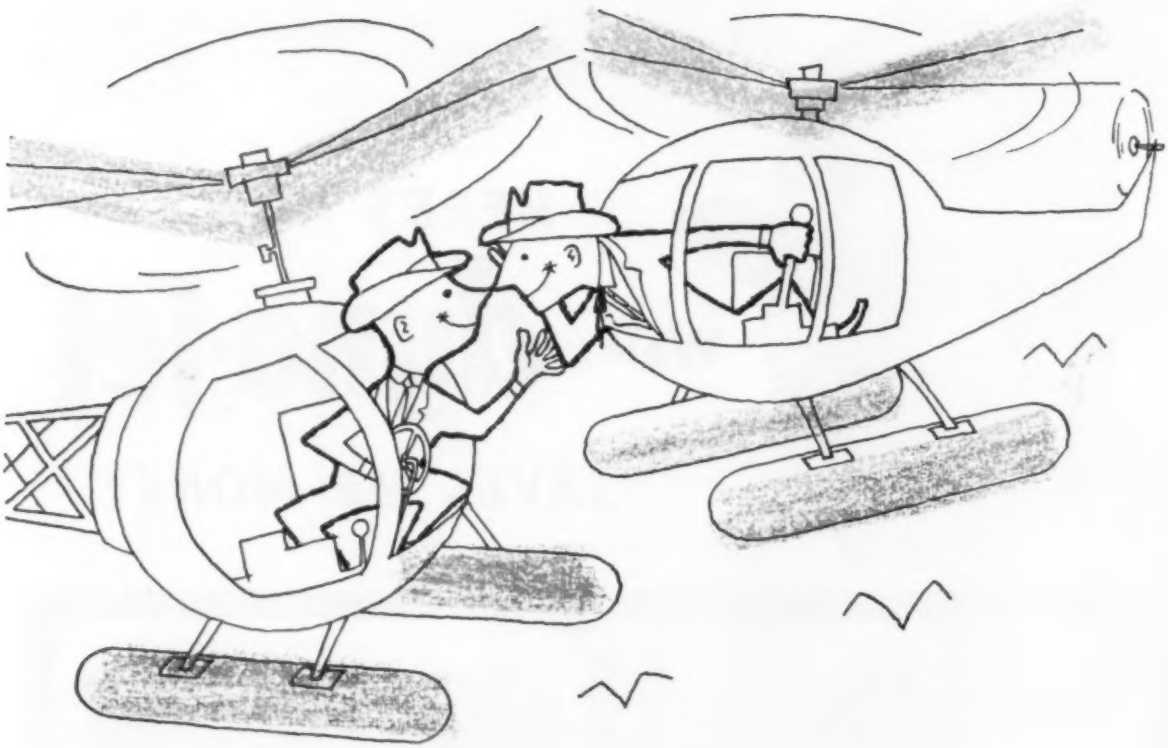
Reprints are Available

Dear Sir:

We would like to have a reprint (or tear sheets) of the article beginning on page 105 of the February 24 Oil and Gas Journal titled "A Study of the Future Productive Capacity and Probable Reserves of the United States" by Warren Davis.

M. Wilson
A. J. Boynton & Co.
Engineers and Technical Counselors
Chicago

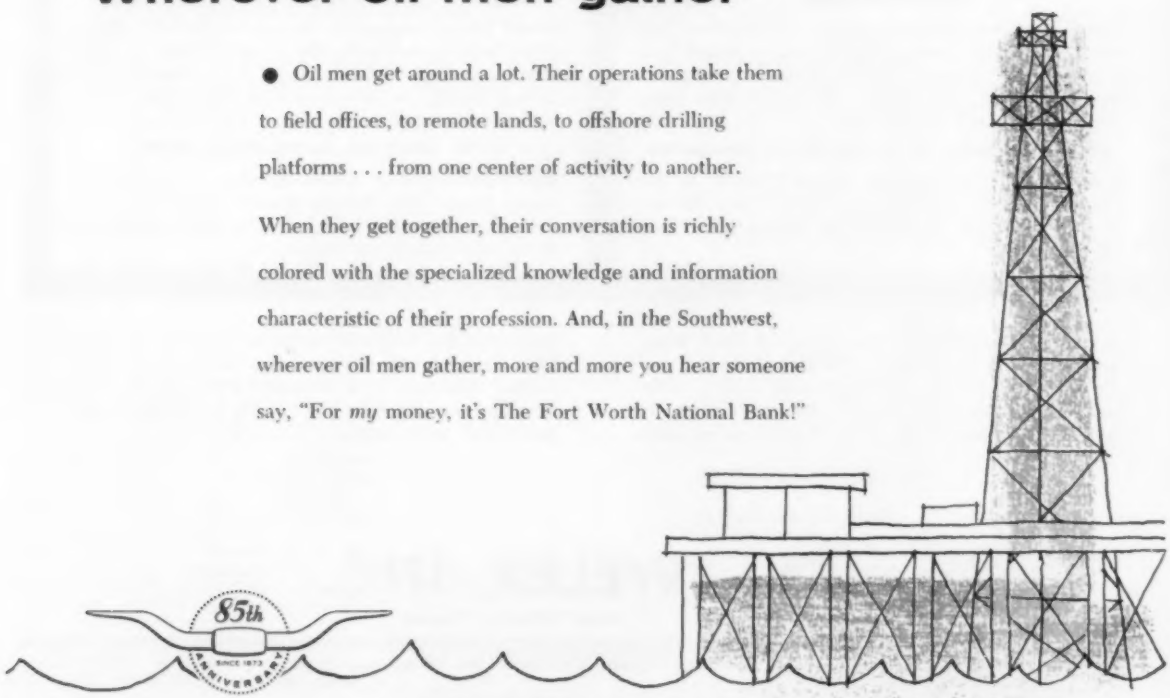
Editor's note: The article, "A Study of the Future Productive Capacity and Probable Reserves of the U. S." by Warren Davis, which appeared in The Oil and Gas Journal February 24, 1958, is attracting wide attention in the industry, both from technical personnel and petroleum economists. A reprint supply is available and single copies will be sent without charge. Address: Editor, P.O. Box 1260, Tulsa 1, Okla.)



"Wherever oil men gather"

● Oil men get around a lot. Their operations take them to field offices, to remote lands, to offshore drilling platforms . . . from one center of activity to another.

When they get together, their conversation is richly colored with the specialized knowledge and information characteristic of their profession. And, in the Southwest, wherever oil men gather, more and more you hear someone say, "For *my* money, it's The Fort Worth National Bank!"



THE FORT WORTH NATIONAL BANK

Helping Build a Greater Fort Worth and Southwest

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION
CAPITAL AND RESERVE ACCOUNTS OVER $20 MILLION

HERE'S HOW Welex dyna-jet* SAVES ME MONEY

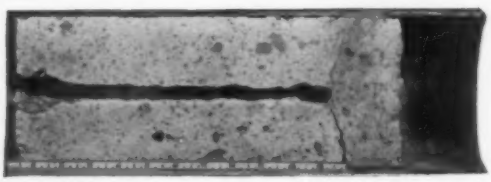
I

The Welex Dyna-Jet performance record since this new concept of perforating was introduced has proved itself a real money-saver to producers throughout the oil industry. Production data from every area shows an average

40% decrease in break-down pressures

This is more proof that the Welex Dyna-Jet is the greatest improvement in perforating since the introduction of the jet process by Welex more than 12 years ago.

II



Actual field performance has surpassed even laboratory experiments with the Welex Dyna-Jet. The actual meaning of *205% greater hole volume than present casing jets* takes an added importance when performance records show an average

40% increase in injection rates

The Welex Dyna Jet is a jet perforator with double-barrel power that insures greater production per unit of perforation and gives you extra dividends from your completion dollar.

An actual case history from a group of West Texas wells is a vivid example of Welex Dyna-Jet performance: A division geologist with a large independent stated that although his wells normally had been breaking down at 2400 p.s.i., recent wells perforated by Welex Dyna-Jet broke down at only 1200 p.s.i. At the same time, he reported that normal injection rates averaged between 18 and 20 bbls./min. Injection rates in his Welex Dyna-Jet perforated wells averaged 37 bbls./min.

ORIGINATORS OF Welex JET PERFORATING

WELEX, INC.

Fort Worth, Texas

*Trademark of Jet Research Center, Inc.

Division offices in Dallas, Denver, Houston, Los Angeles, Midland, New Orleans, Tulsa and Wichita • Subsidiaries in Canada, Peru and Trinidad

Journal's $11-million error

Dear Sir:

On page 181 of The Oil and Gas Journal, January 27, 1958, under the heading of "Journal Survey of Petrochemicals Growth," you have made the following statement:

"Oronite Chemical Co. (Standard Oil Co. of California subsidiary) has asked for $12,000,000 Louisiana state-tax exemption to expand plant at Oak Point, La."

It is possible that you obtained this information from the Louisiana State Assessor's office, in which case the amount is in error. We are completing a program, approved in 1956, involving an expenditure of approximately $1,200,000. It is possible that a decimal point has been misplaced.

J. T. Deane
Vice President, Manufacturing
Oronite Chemical Co.
San Francisco

Gulf's statement challenged

Walter S. Hallanan, president of Plymouth Oil Co., had this to say about the statement of Ralph O. Rhoades, Gulf Oil Corp. vice president, who said that he was unconvinced that imports "have anywhere nearly reached the levels that might jeopardize the nation's security" (OGJ, Mar. 10, p. 66).

"Rigid mandatory controls over the import of crude oil are essential to survival of the domestic industry. (Rhoades' statement is) . . . an obviously self-serving declaration . . . (it is) . . . almost incredible."

CALENDAR

MARCH

20-21 New England Gas Association, annual meeting, Hotel Statler, Boston.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

23-30 Mexican Association of Petroleum Geologists, Mexico City.

24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

24-26 Western Petroleum Refiners Association, annual meeting, Hilton Hotel, San Antonio, Tex.

26 Petroleum Equipment Suppliers Association, southwestern district meeting, Shamrock-Hilton Hotel, Houston.

26-28 American Power Conference, sponsored by Illinois Institute of Technology, Hotel Sherman, Chicago.

27 Commercial Chemical Development Association, annual New York meeting, Statler Hotel, New York.

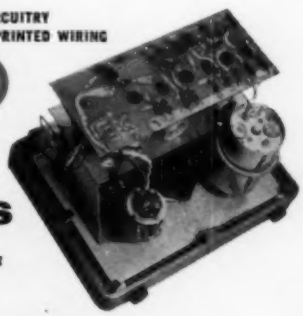
true portability wherever you go

ALECTRA
test instruments

MODEL 10A, A-C ELECTRONIC VOLTMETER
1 mv to 300v full-scale
5 cps to 500 kc
MODEL 40A, ATTENUATOR
0.2 db accuracy, d-c to 600 kc
1-db steps to 82 db
MODEL 30A, D-C ELECTRONIC VOLTMETER
8 ranges—0.05 to 150 volts d-c
Scale zero-centered
MODEL 20A, TEST OSCILLATOR
15 cps to 150 kc
Less than 1-ohm output impedance

LABORATORY PRECISION . . . *in the field*
Ideal for field-testing and the maintenance of geophysical instruments, Alectra's *portable* Test Instruments provide laboratory precision even under the most adverse field conditions. These space-saving, miniaturized units are lightweight and rugged. Salient features are battery operation, transistor circuitry, printed wiring, and stable operation with no warm-up time. Most modern and complete line of portable test instruments available anywhere, each of the 10 Alectra units is identical in size. Rubber feet and collapsible leather handles guarantee easy, practical stacking. Alectra's new 4-PAK instrument rack permits 4 instruments to be carried easily with one hand. Instruments are available from stock and competitively priced. *Contact your CEC Field Office, or write today for Bulletin CEC 7000-X16.*

ALL-TRANSISTOR CIRCUITRY
ON PRINTED WIRING



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Consolidated Electrodynamics

325 North Altadena Drive, Pasadena 15, California

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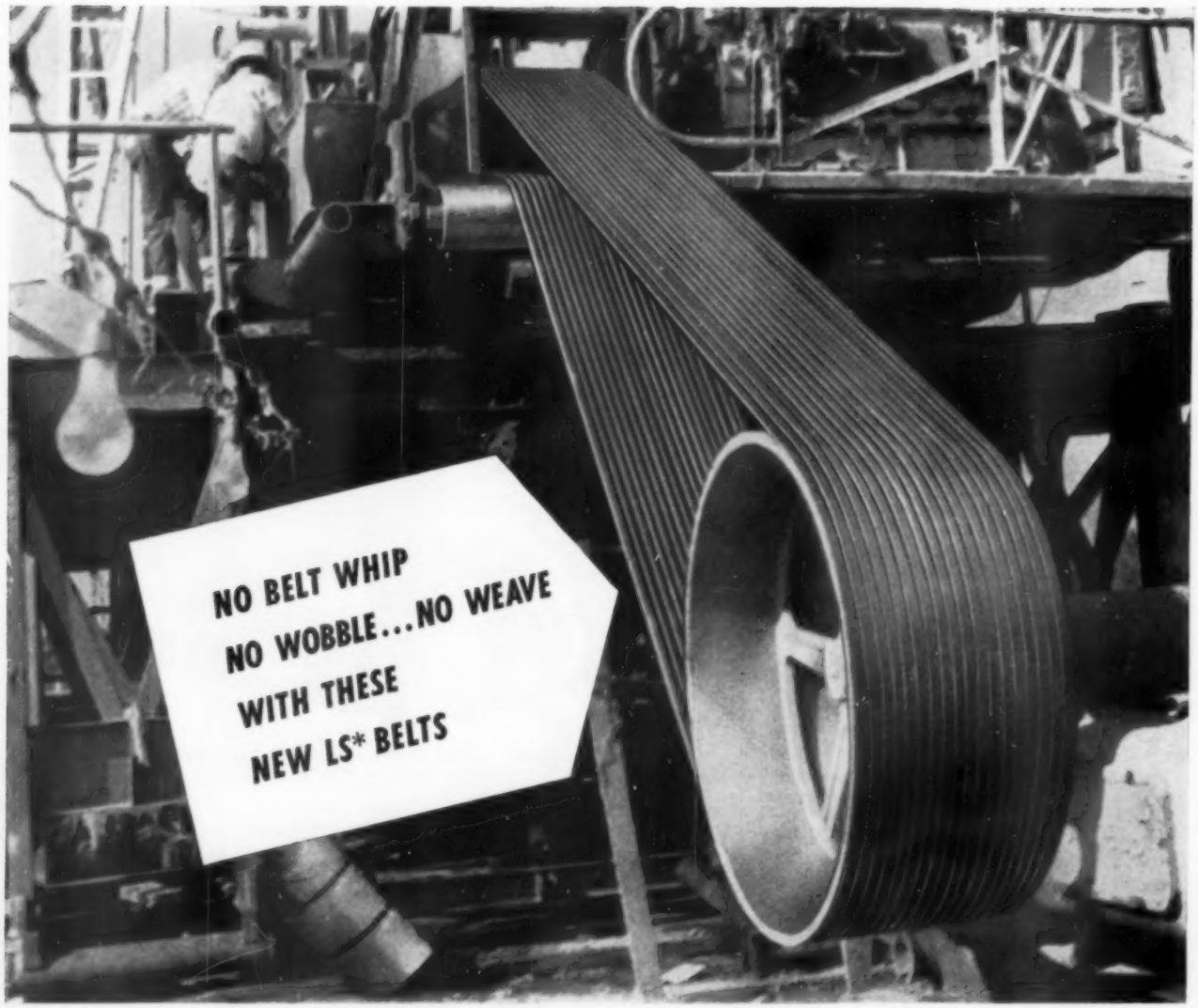


New CONDOR LS* V-BELTS Come Matched to Stay

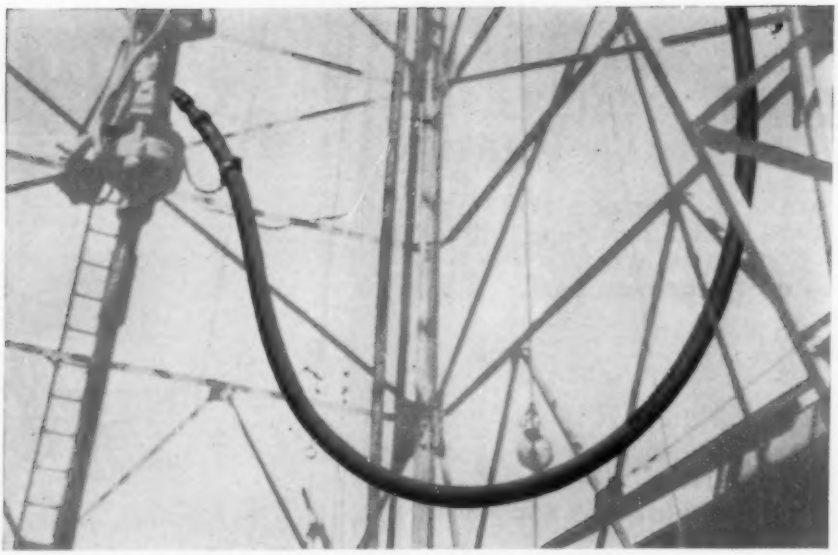
Give "More Use ~~per~~ for your Dollar"

Top to bottom, *every* part of a Condor LS Belt is "length stabilized"... *engineered* to minimize belt stretch and eliminate whip and turnover that leads to belt failure. No whip, no wobble, no weave—a set of matched Condor LS Belts *stays* matched to outperform and outlast any other V-Belt under the heaviest loads. Condor LS Belts set new standards of performance. Write for Bulletin #M210.

- **New "Stabilizing" Section**
- **Repositioned Belt Strength Members**
- **Length Stability *Without* Stretch**
- **Smoother, Cooler Running**
- **Moisture-Proof Vacuum Packaging**

Each Section C and D long center Condor LS Belt is measured under controlled humidity . . . length certified and tagged . . . and vacuum sealed in aluminum-lined, moisture-proof bags. Result? Factory-fresh belts. Positive matching . . . no shrinkage or elongation in storage . . . sustained uniformity on your drive!

*Length Stabilized



RAY-MAN ROTARY HOSE—Unequalled strength *plus* flexibility . . . unusual resistance to kinking or accidental crushing. Ray-Man CBL Rotary Hose holds steady in the rig without whipping . . . even under pressures of deep drilling. Built-in coupling with leak-proof "Lip Lok" seal prevents blow outs. Write for Bulletin #6743.

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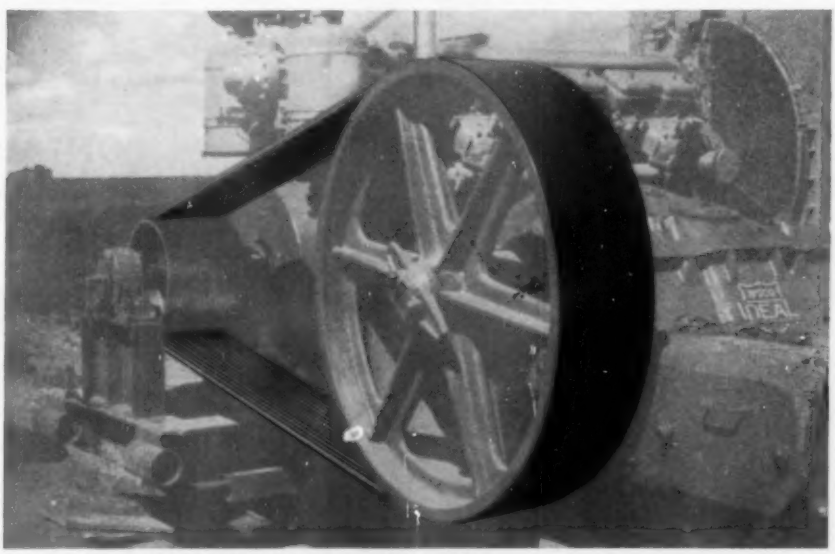

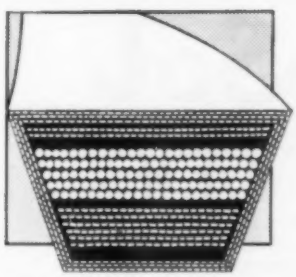

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Figs. 400P, 600P, 700P, 800P

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Standard Size, Figs. 400T, 500T

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Figs. 600-800-900

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Sand is deposited into blind cage above the plunger and is discharged every stroke of the pump. The bottom of plunger is sealed to eliminate slippage. Easy on surface equipment. Lower lifting cost with Sealed-Off Pumps.

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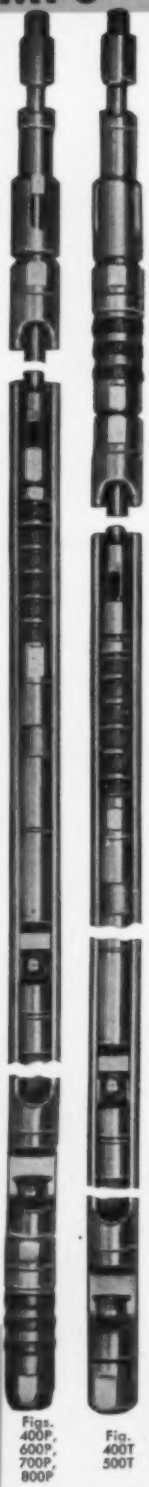

Figs. 400P, 600P, 700P, 800P — Figs. 400T 500T

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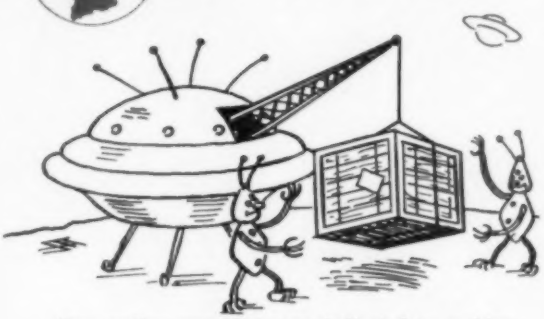

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27-29 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Southwest conference, St. Francis Hotel, San Francisco.

28-29 AIME Student Paper Contest, sponsored by Oklahoma City and University of Oklahoma chapters of Society of Petroleum Engineers of AIME, University of Oklahoma, Norman, Okla.

29 North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.

31-April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

31-April 2 American Institute of Electrical Engineers, southwest district meeting, Mayo Hotel, Tulsa.

APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.

2 Petroleum Equipment Suppliers Association, eastern district meeting, Duquesne Club, Pittsburgh.

8 American Institute of Chemical Engineers, Philadelphia-Wilmington section, University of Pennsylvania, annual meeting, University of Pennsylvania campus, Philadelphia.

8-9 Gas Compressor Institute, sponsored by University of Kansas and Southwest Kansas petroleum industry, Randall's Cafeteria, Liberal, Kans.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

13-18 American Chemical Society, national meeting, San Francisco.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

15-18 American Welding Society, annual meeting and welding show, Kiel Auditorium, St. Louis.

16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.

16-18 National Petroleum Association, fifty-fifth semiannual meeting, Hotel Cleveland, Cleveland.

17 Petroleum Equipment Suppliers Association, Pacific district meeting, Beverly-Hilton Hotel, Los Angeles.

17-18 Texas Technological College, fifth annual West Texas oil lifting short course, Lubbock, Tex.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.

17-18 Geophysical Society of Tulsa, Tulsa Geological Society, annual midwestern exploration meeting, Tulsa.

17-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest regional conference, Spokane, Wash.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

23-25 Second International Williston Basin Symposium, sponsored by Saskatche-

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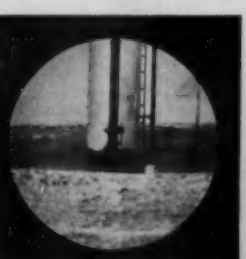

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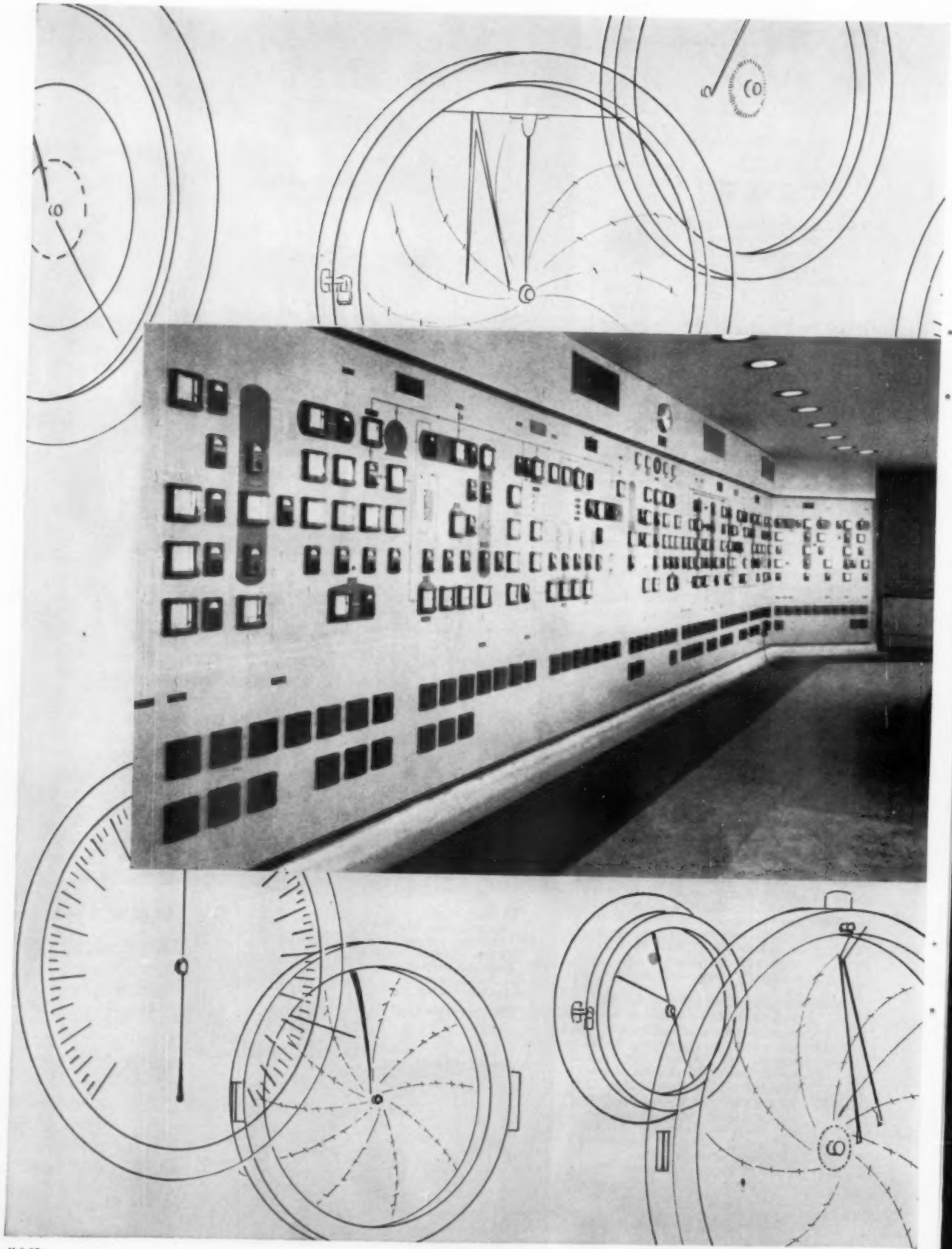

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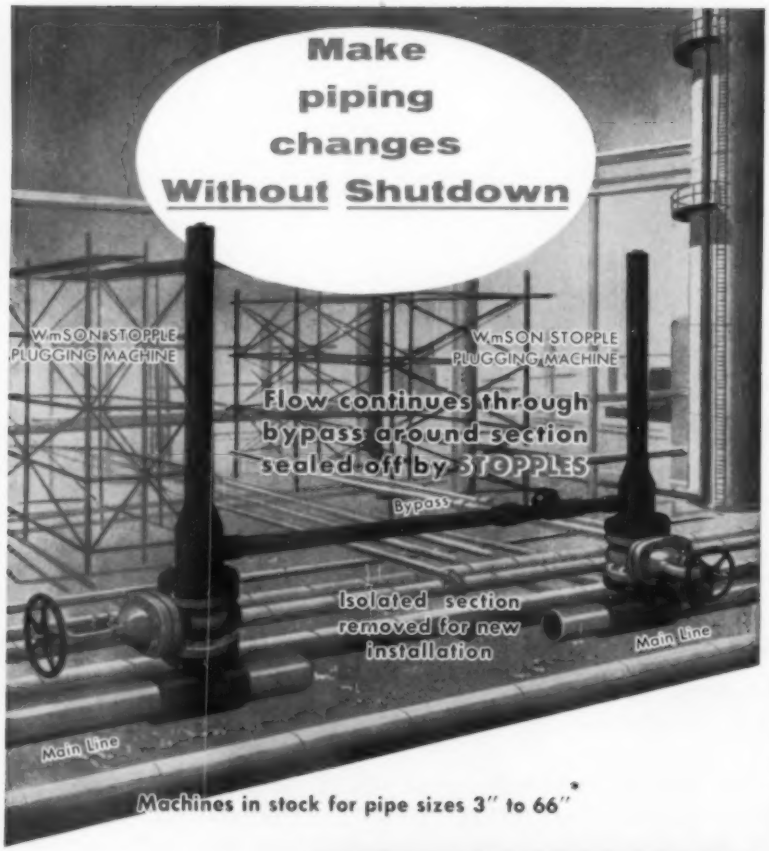
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wan Geological Society and North Dakota Geological Society, Regina.

27-30 American Association of Petroleum Geologists, Rocky Mountain section, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

28-29 Independent Petroleum Association of America, mid-year meeting, Sherman Hotel, Chicago.

28-30 Southern Gas Association, annual convention, Dallas.

29-May 1 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, annual joint meeting, Adolphus Hotel, Dallas.

MAY

5-6 Society of Petroleum Engineers of AIME, North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

5-7 Purdue University, thirteenth annual industrial waste conference, Purdue Memorial Union Building, Lafayette, Ind.

5-9 American Gas Association, distribution, production, and transmission conference, Roosevelt and Commodore Hotels, New York.

7-9 American Petroleum Institute, Division of Production, eastern district meeting, Deshler-Hilton Hotel, Columbus, Ohio.

8-9 Texas Petroleum Research Committee, eleventh oil recovery conference, symposium on "A Century of Texas Oil, 1875-1975," University of Texas, Austin.

11-14 Texas Independent Producers and Royalty Owners Association, annual membership meeting, San Antonio, Tex.

12-14 Chemical Institute of Canada, National Research Council, eighth Canadian high polymer forum, Macdonald College, St. Anne de Bellevue, Quebec.

12-14 Instrument Society of America,, symposium of analysis instrumentation division, Shamrock Hilton Hotel, Houston.

12-15 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

21-22 Western Petroleum Refiners Association, West Texas-New Mexico regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

21-23 Rocky Mountain Oil and Gas Association, thirteenth annual convention, Cosmopolitan Hotel, Denver.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

26-28 Chemical Institute of Canada, annual conference and exhibition, Royal York Hotel, Toronto.

27-29 Annual Short Course in Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.

JUNE

2-4 Petroleum Electric Power Association annual meeting Texas Hotel, Fort Worth.

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MISSION E-Z SWABS

are fast, safe and economical

1. FREE FALLING

On the down stroke, clearance between fins and pipe allows swab to fall free.

2. PASSES SMOOTHLY THROUGH TIGHT SPOTS

Flexible E-Z Swab Rubber fins allow swab to pass smoothly through tight spots on both up and down strokes.

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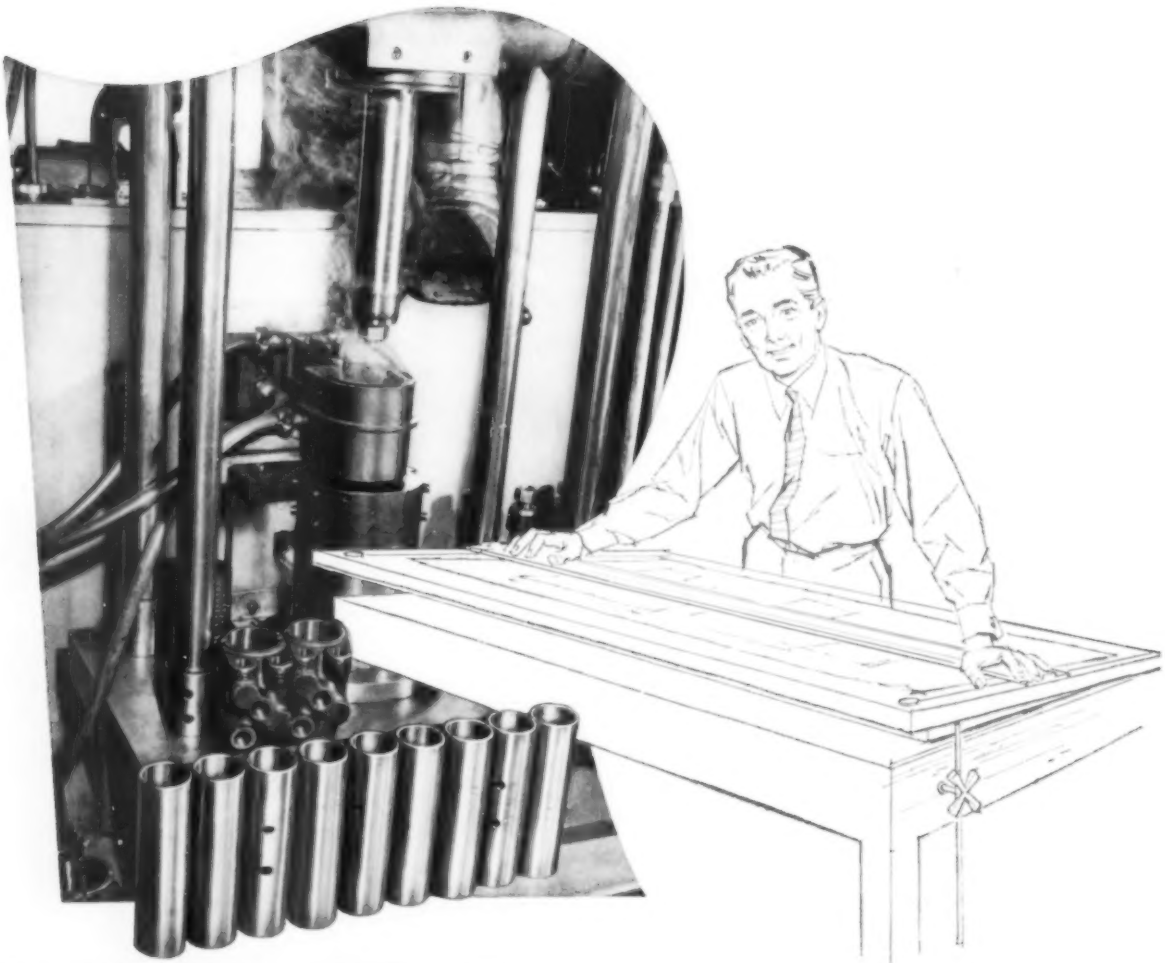

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JOURNALLY SPEAKING

Of Smith and history

NO, the Big Yellow Book isn't starting a garden page.

There's an oil well under that pile of vegetation.

Bill Smith of our Los Angeles office snapped these photos on the way home one evening. He just thought it was interesting, he said, to see what one royalty owner did to make California more beautiful while his neighbors left their ancient derricks barefaced and protruding "in all of their eyesore splendor."

And after taking the picture, Bill did a little research on this downtown producing area. It's Los Angeles City field, brought in way back in 1892,

The wells are about 800 ft. deep, have a daily production of about 1½ bbl. But in its 66-year life the field has produced more than 20 million barrels. It's been going downhill since 1908, its peak year, but there still are 80 producing wells.

This little contribution to oil lore is typical of Smith's "extra" contributions. Bill is a curious man. He also has a sense of humor.

For example: Once while visiting in the Tulsa office he wrote a letter to his wife in California. He labeled the first page "page 2" and started out "but the police didn't think it too serious and let us go."

His wife was much upset until she learned the truth, but she, too, has a sense of humor. Just before returning to L.A., Bill called home to let his wife know when to expect him and tried to reverse the charges. He heard a conversation something like this:

"Bill Smith calling from Tulsa, is it all right collect?"

"Bill who?"

"Bill Smith, calling from Tulsa."

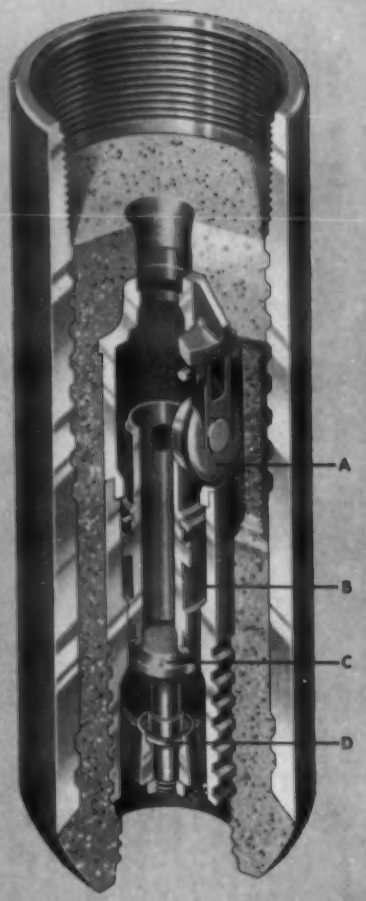
"I don't believe I know a Bill Smith in Tulsa."

"But this man says he is your husband."

"Oh, THAT Bill Smith."

This photo story isn't really urgent enough to crowd its way into the news section. Yet, we hated to let Smith's research go to waste. So here is Bill's mole-hill on the mountain of oil information. Who knows, some day you may be glad you knew about it.

—Ted Armstrong.



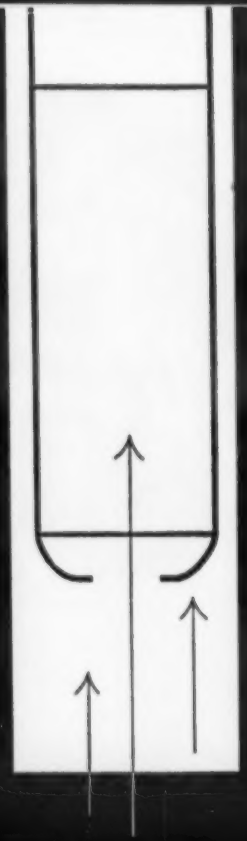
A Flapper Type Back-Pressure Valve activated at option of operator.

B Sleeve Valve } Control rate of flow and volume of fill-up fluid.

C Sleeve Valve Seat }

D When operator shears this Shear Ring (1,000 psi on casing), Flapper Valve is released to form a Back-Pressure Valve for floating or cementing.

Baker DIFFERENTIAL FILL-UP Shoe
Product No. 1061

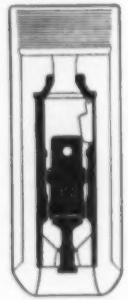


It fills casing from the bottom up

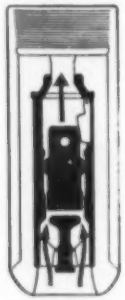
With Baker DIFFERENTIAL FILL-UP Shoes and Collars, casing is filled automatically from the bottom up, *while it is being run*... and because DIFFERENTIAL Equipment contains a Variable Valve *that opens and closes* to synchronize the rate of "fill" with the rate of lowering the casing, maximum reduction of destructive high-pressure surges is obtained.

This "controlled automatic fill" saves up to one-third of running-in time because... (a) time-wasting surface filling of casing is eliminated; and (b) casing can be run in at a faster speed, reducing the possibility of sticking, without causing destructive high-pressure surges. Pressure surges over 5000 psi can be created below casing equipped with floating equipment each time a joint is lowered. Damage caused by these high-pressure surges and the cost of this damage in bad cement jobs, lost circulation, and decreased production is becoming a matter of concern to many operators.

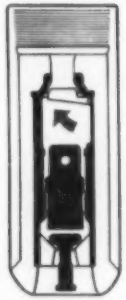
HOW DIFFERENTIAL EQUIPMENT WORKS



RUNNING-IN
Sleeve Valve in closed position



RUNNING-IN
Sleeve Valve in opened position



CEMENTING OR FLOATING
Flapper Valve released

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Take a realistic look at imports

LET'S be realistic about imports and their relation to domestic conditions during the next few months.

From a practical standpoint it is impossible to expect any substantial curtailment of imports in the immediate future. There are only two ways in which this could be brought about:

- An act of Congress. The only logical place for such is an amendment to the pending bill to extend the Reciprocal Trade Agreements Act. This bill involves a great many controversial issues in addition to oil. The House committee is now holding hearings, which may last a month. After that it goes to the floor of the House, then to the Senate committee, then the Senate floor, then to conference. So no relief from this source could be expected before June.
- Administrative action. The cabinet committee has already set its quotas until July 1, and is currently considering the program for the following year. It is unlikely that it will attempt to roll back present quotas during the remainder of their terms, and even if it should it would take a couple of months for this to have a noticeable effect on the total supply of crude.

Looking beyond that, it is equally unrealistic to expect that imports will be cut very many thousands of barrels per day below their present rate during the next fiscal year. So many pressures are operating in favor of maintaining a fairly substantial volume of imports that the domestic industry will be lucky to get even a token reduction, no matter what method is employed.

Furthermore, even if, through some near-miracle, imports should suddenly be reduced by a couple of hundred thousand barrels per day this week, the effect would not be great for several months.

Barring another near-miracle to boost consumption, it would take a long time to work off present high stocks of crude and products to the point where the demand for domestic crude could rise to a point satisfactory to producers.

THAT BEING THE CASE, producers should stop their wishful thinking and blind emotionalism about imports. They must tighten their belts and prepare to live with present conditions for a good many months.

This means that crude output must be held below the level of actual consumption for a couple of months, at least, to reduce stocks and encourage refiners to keep their runs down. If not, the crude market will become even more demoralized.

About the most that producers should count on is that imports won't increase during the coming year. In the meantime they must adjust to the admittedly unsatisfactory supply-demand conditions.

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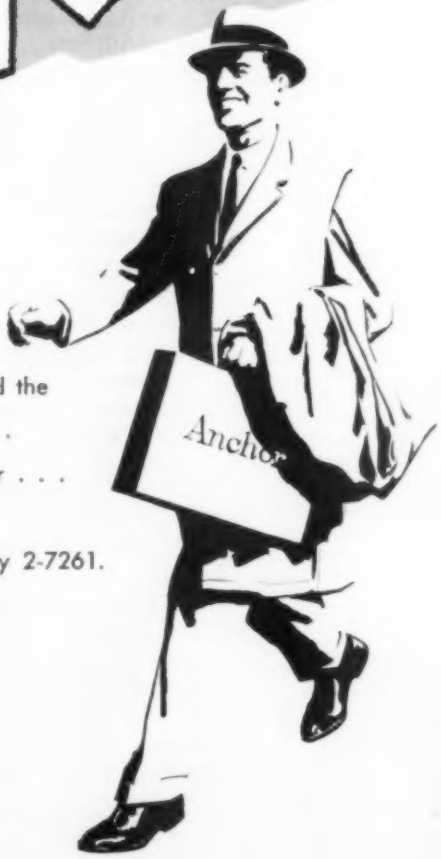

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The OIL AND GAS JOURNAL

March 17, 1958

Odds Are Against Mandatory Controls

Pressure is mounting for Eisenhower to use his authority to cut back the flow of foreign oil. But the cabinet committee again is expected to insist on a voluntary program. Reason: It's convinced mandatory controls won't work.

THE PRESIDENT so far has kept silent about his course of action on the imports question. And this has encouraged the pressure on him and increased speculation about his next move.

The tug-of-war developing around the White House stems from:

... **Pressure by many** members of Congress and domestic crude producers to force down the volume of imports by presidential edict.

... **Advice from members** of his own administration to stick with present voluntary controls.

Since the President is known to rely heavily on the advice given by his own counselors, insiders conclude that when the air clears from the present furor any new policy announced will be based on voluntary curbs.

The inside story ... The Cabinet Fuels Committee recessed its sessions so that members could study several ramifications of the import problem before drawing up a recommendation. These include:

... **Effect of import controls** on U.S. foreign relations.

... **Laws available** to put teeth into voluntary controls.

... **What's involved if mandatory controls** should be imposed.

... **The place of products** in our import-control policy.

Before taking any action, the cabinet committee wanted to talk with Canada and Venezuela, both out of courtesy and from actual necessity.

This desire explained the presence in Venezuela last week of Capt. Matthew V. Carson, Jr., imports administrator; top state department officials, and Ernest O. Thompson of the Texas Railroad Commission.

There are many reasons behind the talks going on. The economies of both these nations would be pinched by any new cuts in the flow of their oil into this country. Both are vital to American defense plans and to our foreign trade. Both at present have delicate political situations. Venezuela has just emerged from a revolution. Canadians face a federal election this spring.

In addition, a postwar treaty with Venezuela literally calls for such consultation before any change in our oil-import policies is contemplated.

Another reason for delay by the cabinet committee is to determine if laws are available to tighten up the present voluntary plan. Some students of the question think the government can wield an economic stick over companies who refuse to comply with present quotas. They are delving into the law books to be sure, though.

There is no doubt in the minds of the cabinet committee, however, that the President could take action to make the present voluntary program mandatory if he wished.

But committee members oppose such action. They see these results:

... **Court fight.** Some oil company would surely take the question of the President's power to court. Injunctions could delay enforcement a year or more. Everyone could then rush to import full blast, and chaos might result equal to East Texas field in the early 1930's.

... **Bureaucracy.** With mandatory controls, the Government would have to create a regulatory commission as large and complex as FPC right from the start. It would require large appropriation, would be slow moving, and would involve oil deeply in politics.

Besides, a government oil bureaucracy undoubtedly would eventually result in the states' losing some of their freedom of action in regulating production and conserving resources.

Other committee members also are eager to determine how imports of products fit into the current picture. Of particular interest is how much unfinished gasoline is coming into the country and what duty is paid on it.

Unfinished gasoline formerly paid a duty of 1¼ cents per gallon, the same as finished gasoline. But the Customs Court in New York recently allowed a duty of only ¼-cent per gallon (Journal Newsletter, Mar. 10, p. 1).

This puts the unfinished gasoline in a nice competitive position with domestic gasoline since it can be processed easily and cheaply into finished product.

When cabinet committee members complete these studies, they plan to convene again. No date for the new session has been set.

Action in Congress ... The President is getting advice from congressional sources that unless imports are brought under firm control, Congress will add a compulsory quota clause in the Reciprocal Trade Agreement Act.

If Congress adds protection for oil, it likely will protect a score of other commodities feeling the pinch of foreign competition. The result would be a wrecked trade act.

Sen. Lyndon Johnson, Senate majority leader, meanwhile, joined the clamor for action in a personal letter to the President. He asked that the President follow a double course:

... **Impose a mandatory reduction** by 20 per cent of oil imports under authority granted the President under the trade agreement act.

... **Set up a system** whereby imports can be cut back from month to month on a basis comparable to cutbacks being made in the domestic industry by prorated states.

The Johnson letter is in line with the views of Thompson as given recently to Secretary of Commerce Sinclair F. Weeks. Weeks is chairman of the cabinet committee.

Johnson informed the President that imports already have had a grave impact on an important domestic in-

dustry. If unchecked, he said, they will have a greater depressing effect upon the economic standards.

"The domestic oil industry is reeling under the impact of imports. Imports have continued to mount and have been offset by cutting production to a point where in Texas the allowable for March has been set at 9 days," the Texas senator wrote.

"No industry can be prosperous and strong when it operates on the basis of 9 days out of the month. Any depressed industry tends to drag down other segments of our economy with it. To this must be added the importance to our defense efforts and our preparedness of having a strong domestic oil industry in the event of an emergency."

Johnson stated it is difficult to justify cutbacks by the domestic industry when no similar cutbacks are suffered by importers.

A great debate . . . Although Johnson blamed imports for present woes of the oil industry, the issue is still the subject of a controversial debate in Washington.

Some members of the cabinet committee insist voluntary controls are doing the job originally expected. In this camp are Secretary Weeks and Carson. They say the latest figures show imports are close to the target (OGJ, Mar. 10, p. 94).

Many congressmen and independent oil men testifying before the House ways and means committee contradicted this view. They pointed out that at least three oil firms have exceeded their quotas, one a flagrant violator; that another refiner began importing without even waiting for a quota, and other importers are giving signs they can't hold the line unless all do.

Topping off this situation are the actions of new companies seeking quotas for the first time and older importers asking quota increases. Their requests, if granted, would add 400,000 bbl. daily to the present national quota of about 1,000,000 bbl. daily.

Oil groups appearing before the House committee presented a variety of approaches to mandatory controls. They included:

. . . **IPAA**—asking mandatory quotas on crude and products. The current percentage formula would be based on the relationship imports in 1954 had to domestic demand that year.

. . . **TIPRO**—asking competitive duties by tariff or excise tax.

Sen. Ralph Yarborough of Texas also asked the committee to favor an import tax of 84 cents a barrel on foreign crude and a higher tax on products.

On the other side was the testimony of T. S. Petersen, president of Standard Oil Co. of California. He asked the committee to continue the trade act for another 5 years without change. He said the national security clause in the act is enough authority to control imports.

Petersen declared the President could set mandatory quotas on oil imports if the facts warranted. He explained he favored this course rather than quotas set by Congress. His reasoning: Quotas by law would take 2 years to remove if conditions changed. And he said the present oil surplus is "transitory."

The outlook . . . The House committee will wind up its hearing late in March, climaxing with another appearance from Secretary Weeks.

After that, a stormy executive session of the group is likely. Prospects are that any trade act recommendations will not be reported out until after the Easter recess. A majority of the committee reportedly opposes an oil quota law. In the House as a whole, however, sentiment is reported much stronger for quotas.

But before the trade act reaches the House floor, the cabinet committee is expected to put forth a tougher plan for voluntary imports control. Its strategy will be to take the steam from any big push to wreck the trade act with an oil-quota fight.

New Imports Hearing Set in Texas

TEXAS' IMPORTS - STUDY commission, already taking a dim view of high oil imports following its first hearings February 25-26, will hear testimony from new witnesses at a March 18 hearing in Abilene, Tex.

The commission was set up earlier this year by Gov. Price Daniel to determine the effects of oil imports on the Texas economy. It also is responsible for recommending a course of action for the state—if there is need for action.

Next week's star witnesses will be Capt. M. V. Carson, administrator of imports program, and Olin Culberson, chairman of the Texas Railroad Commission.

Texas hurting . . . Though having held only one hearing so far, the commission already has decided on one finding—that imports are hurting Texas.

The study group last month took testimony from Governor Daniel and a host of other state officials, business and educational leaders, and oil association spokesmen.

Dr. John R. Stockton, a commission member and director of the University of Texas Bureau of Business Research, summed up the commission's work so far.

The present situation in Texas, Stockton said, was termed a crisis by essentially all witnesses. It has become particularly acute because the increase in oil imports has come at a time "when the domestic economy is in a period of rather distinct recession."

The effects of the heavy cuts in Texas' oil-production allowables are readily apparent. The Texas economy already has been hard hit by reduced taxes from production and reduced income to producers and royalty owners. Cuts in crude production, Stockton said, have slowed exploration. This has decreased income to everyone working in the industry or selling materials and services to it.

Oil employment is off about 8,000 but will fall off much more, he said.

Money pinch . . . A survey of Texas banks shows that a substantial number of oil loans are being refinanced because of decreased production. And some operators are unable to extend loans because production is too low to justify the risk.

This, Stockton said, is not a situation "that will correct itself in time."

"If the forces of economic law are allowed to divide the market for petroleum, foreign oil will inevitably capture a major portion of the United States market," he said. "Under present costs, most of the oil produced in the United States cannot compete in price with oil from the Middle East."

Thus, the U. S. must choose between shifting to reliance on foreign sources of oil or curtailing imports and continuing to depend to a major degree on the secondary reserves of this country, Stockton said.

EQUIPMENT is airlifted to remote Four Corners spot before . . .

Unique Microwave Is Installed

MULE PACKS bowed to the jet age when Four Corners Pipe Line Co. installed its unique microwave system atop 9,800-ft. Roof Butte in the heart of the rugged Lukachukai Mountains of northwestern New Mexico.

In an unprecedented airlift, a jet helicopter especially designed for high altitudes hauled three tons of delicate microwave equipment in one of the nation's most difficult flying areas.

The cargo was part of the quadriphase microwave system which will provide supervisory control and voice functions over an 850-mile route from the Four Corners area to Los Angeles. The system involves eight towers.

General Electric engineers decided to fly the material to the mountain top when weather conditions made it virtually impossible to travel the rough snow-clogged roads which extend only part way up the rocky peak.

The airlift was the first demonstration of Republic Aviation's "Alouette" jet helicopter for commercial purposes. It previously had been used only in military operations.

The peak is not far from the pipeline's Red Mesa station, terminal for the 16-in. crude line, which is nearing completion. The Roof Butte installation is a vital part of the network.

Equipment was designed with extra dust-filtering equipment because of atmospheric conditions. Extra precautions were taken in relationship to temperature control and cooling. The system was built so that maintenance would be necessary only at infrequent intervals.

The line will be remotely controlled from Los Angeles. Since the terrain of the line ranges from 600 to 6,000 ft. above sea level, rapid control is needed to take care of changing surge conditions.

The microwave system makes possible several long paths in the communications setup. Three of these paths are more than 100 miles, or twice as long as the usual hops found in pipeline and utility microwave plans.

The network provides communication with mobile radios in cars along the route. The plan includes a dial-selective party-line telephone-type channel and a private channel.

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Gas Bill Is Doomed

O'Hara claims. But speaker declares it is just delayed.

ONE SPONSOR of the Harris-O'Hara natural-gas bill said the measure is dead, but House Speaker Sam Rayburn refused to confirm this.

Rep. Joseph P. O'Hara (R., Minn.), says he feels Speaker Rayburn will not even bring the measure to the House floor for a vote.

A backer of the measure—to ease up federal price and other controls over independent gas producers—O'Hara insisted the bill is a good one as it would encourage ample supplies of gas for consumers.

But, he said, the wave of protest over the dinner arranged by H. J. (Jack) Porter, Republican national committeeman from Texas, ended the bill's chances.

This week Rayburn had this comment:

"I say what I said about the bill before, and that is that its consideration has been delayed."

Rep. Oren Harris (D., Ark.), chairman of the House commerce committee, who is the other sponsor of the measure, has been ironing out kinks to win coal support for the measure. Also, he has been talking with White House officials about added White House support.

A nose count, however, indicates that the bill would be defeated on the floor of the House today. The measure may be 75 votes short of passage, this count showed.

Finally, if the House should vote for the measure, it will need to go through Senate committee hearings, and then floor debate.

Senate Confirms Foote

PAUL D. FOOTE, retired executive of Gulf Oil Corp., was confirmed March 10 as assistant Secretary of Defense for research and engineering.

Foote, who was nominated August 16, 1957, faced delay when he declined to sell his holdings in Gulf. Approval came after a letter from Secretary of Defense McElroy saying that Foote would "have nothing to do with Defense Department contracts."

Foote, aged 70, receives a pension from Gulf.

Despite the letter, Senators Henry Jackson (D., Wash.), and Sam J. Ervin (D., N.C.), voted against confirmation in the Senate Armed Services committee. Seven other committee members voted for confirmation.

Crude Reserves Fall Below '57 Figures

• Record production due to the Suez crises, coupled with fewer discoveries and extensions, caused the drop. The decline is the first since '47. Natural-gas liquids also fell off, but natural-gas reserves increased.

THE OIL INDUSTRY went to the bank last year to draw on its reserves of crude and gas liquids.

The industry is more fortunate with gas. These reserves continued to grow.

Canada is even in better shape. Oil operators there added to reserves of crude, gas liquids, and natural gas.

That is the picture drawn in the latest report on reserves announced last week by committees of the American Petroleum Institute and American Gas Association.

The balance sheet on reserves at the start of 1958 give this picture:

... **Crude oil**—30.4 billion barrels, down 134 million barrels from last year.

... **Gas liquids**—5.7 billion barrels, down 215 million barrels.

... **Natural gas** — 246.6 trillion cubic feet, an increase of 8.8 trillion cubic feet.

... **Canada**—crude 2.87 billion barrels, up 25 million; liquids 394.6 million barrels, up 114.7 million; and gas 20.7 trillion cubic feet, up 1.7 trillion cubic feet.

For domestic producers the decline in crude reserves was the first drop since 1943 and the first drop in gas liquids since 1954.

An explanation . . . It's obvious that the nation used up more oil than the industry's explorers found, but this fact may not be as dismal as it seems.

The poor showing stems from several factors:

... **Record production** last year.

... **Lower volume of new discoveries,** especially for crude.

... **Less oil added by extension** of old fields or revision of past estimates.

Crude production was estimated at 2.56 billion barrels, an increase of 7 million barrels over 1956. Natural-gas liquids output was placed at 352 million barrels, a gain of 6 million.

That's the highest output of liquid hydrocarbons in the nation's history. It resulted from the tremendous production effort the industry made during the Suez crisis and failure to slow down quickly afterwards. Oil producers now are paying the price for this overproduction through current widespread cutbacks.

Oil added from discoveries of new

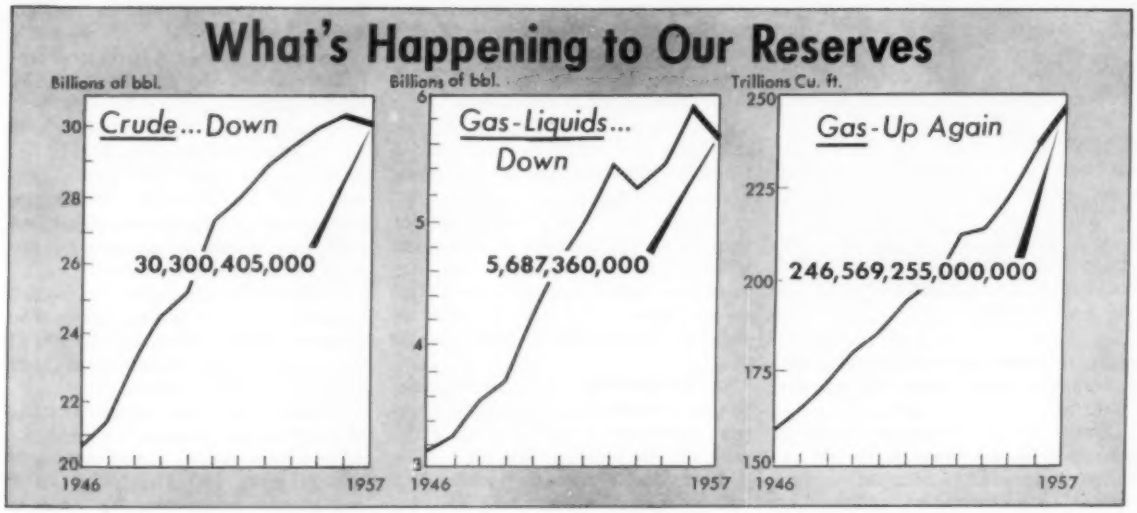
U. S. Crude-Oil Reserves: Thousands of barrels.

	Proved res. 1-1-57	Extensions and revisions	New disc.*	Production in 1957	Proved res. 1-1-58	Change in reserves 1957
Alabama	37,537	3,301	.....	6,429	34,409	—3,128
Arkansas	317,726	14,593	2,271	29,631	304,959	—12,767
California†	3,771,357	312,412	15,060	339,075	3,759,754	—11,603
Colorado	363,750	—1,577	2,645	54,879	309,939	—53,811
Illinois	700,000	23,765	7,172	76,191	654,746	—45,254
Indiana	67,728	10,585	241	11,818	66,736	—992
Kansas	992,211	65,399	13,654	123,780	947,484	—44,727
Kentucky	148,442	4,361	2,541	17,304	138,040	—10,402
Louisiana	3,675,419	376,360	104,259	298,469	3,857,569	182,150
Michigan	55,312	2,273	2,182	10,275	49,492	—5,820
Mississippi	368,205	18,590	9,697	36,942	359,550	—8,655
Montana	331,414	14,628	940	26,991	319,991	—11,423
Nebraska	62,861	11,821	8,038	19,661	63,059	198
New Mexico	835,437	76,992	11,750	92,435	831,744	—3,693
New York	40,196	.....	.....	2,663	37,533	—2,663
North Dakota	195,834	19,083	56,340	13,036	258,221	62,387
Ohio	63,575	10,128	.....	5,553	68,150	4,575
Oklahoma	2,009,798	125,181	17,989	211,447	1,941,521	—68,277
Pennsylvania	134,700	.....	.....	8,210	126,490	—8,210
Texas	14,783,139	699,718	129,541	1,057,258	14,555,140	—227,999
Utah	61,435	61,572	21,635	4,608	140,034	78,599
Virginia	.....	.....	.....	.....	.....	.....
West Virginia	51,221	3,539	.....	2,215	52,545	1,324
Wyoming	1,363,164	155,884	10,192	109,522	1,419,718	56,554
Miscellaneous‡	4,188	—5	50	652	3,581	—607
Total United States	**30,434,649**	**2,008,603**	**416,197**	**2,559,044**	**30,300,405**	**—134,244**

*Only a limited area is assigned to each new discovery, even though the committee may believe that eventually a much larger area will produce.

†Includes offshore reserves.

‡Included are Arizona, Florida, Missouri, Nevada, South Dakota, Tennessee, Virginia, and Washington.



fields or new pools in old fields hit a 6-year low. The volume last year reached 416 million barrels, the lowest since 1951 and a sharp drop from postwar record discoveries of 890 million barrels in 1949.

Extension of known fields and revision of estimates added only 2 billion barrels to reserves last year, lowest since 1950. Of this total, development drilling added 1.5 billion barrels and revisions of last year's estimates 465 million.

In any case, lowered drilling activity contributed to the decline. If wildcat and development drilling had kept pace with 1956 levels, oil men would not have had to draw on reserves so heavily, even with the record production.

The picture is slightly different for

U. S. Natural-Gas Liquids Reserves: Thousands of barrels.

	Proved res. 1-1-57	Extensions and revisions	New disc.*	Production in 1957	Proved res. 1-1-58	Change in reserves 1957
Alabama	.....	.....	.....	.....	.....	.....
Arkansas	42,467	—2,501	89	2,915	37,140	—5,327
California†	311,728	23,085	585	29,669	305,729	—5,999
Colorado	11,545	173	80	833	10,965	—580
Illinois	16,772	—3,255	.....	1,724	11,793	—4,979
Indiana	133	—3	5	21	114	—19
Kansas	171,615	21,698	2,191	6,349	189,155	17,540
Kentucky	7,251	275	138	1,957	5,707	—1,544
Louisiana	1,014,942	—10,580	61,895	47,059	1,019,198	4,256
Michigan	1,068	246	19	96	1,237	169
Mississippi	56,003	1,016	398	3,016	54,401	—1,602
Montana	8,145	—13	.....	327	7,805	—340
Nebraska	6,504	1,364	78	811	7,135	631
New Mexico	414,099	—82,570	4,343	15,324	320,548	—93,551
New York	.....	.....	.....	.....	.....	.....
North Dakota	19,000	.....	5,000	1,300	22,700	3,700
Ohio	1,669	144	16	19	1,810	141
Oklahoma	355,588	7,334	13,818	34,097	342,643	—12,945
Pennsylvania	3,167	261	131	99	3,460	293
Texas	3,379,889	51,756	38,955	198,983	3,271,617	—108,272
Utah	95	.....	.....	4	91	—4
Virginia	.....	.....	.....	.....	.....	.....
West Virginia	26,741	798	266	4,893	22,912	—3,829
Wyoming	53,874	—346	501	2,864	51,165	—2,709
Miscellaneous‡	‡37	2	.....	4	35	—2
Total United States	**5,902,332**	**8,884**	**128,508**	**352,364**	**5,687,360**	**—214,972**

*Only a limited area is assigned to each new discovery.

†Includes offshore reserves.
‡Includes Alabama and Florida.

natural-gas liquids. Discoveries added 128.5 million barrels, a record. But additions through extension of known fields or revision of estimates reached a postwar low of 8.8 million barrels.

With a record production of 352 million barrels of gas liquids, the result was a big drawdown on reserves even greater than that for crude.

This is not the first postwar decline in gas-liquids reserves. They declined 193 million barrels in 1954 but staged an excellent comeback in the next 2 years.

Story of natural gas . . . Louisiana was the star performer in natural gas last year.

Louisiana far outstripped Texas in adding to its gas reserves. Its net additions exceeded 6,382,000 million cubic feet compared to additions of 356,000 million cubic feet of Texas.

Louisiana outgained Texas in both new discoveries and extensions and revisions. Texas, however, produced more than twice as much gas as Louisiana and ended the year with more than twice as much reserve gas.

Oklahoma ranked third in discoveries and net production but placed fifth in gas reserves behind New Mexico, and Kansas.

For the nation as a whole, the net increase in gas reserves of 8,794,686 million cubic feet in 1957 was not anywhere near a postwar record. But on the other hand, only 4 years of the last 12 have shown better gains.

Canada's reserves . . . Alberta continued its dominance as Canada's biggest storehouse of oil, but the province showed signs of slipping.

New Alberta discoveries added 33.1 million barrels to reserves and extensions kicked them up 77.7 million. However, heavy production in 1957 of 139.2 million barrels actually lowered the province's reserves by 28.3 million barrels.

The result is that Alberta's current crude reserves are estimated at 2.36 billion barrels.

Saskatchewan, however, enjoyed a 61.7-million barrel expansion of its reserves. The gain was caused primarily by a 90.8-million barrel gain through extensions of old fields and revision of estimates. Ontario was the only other province to gain.

Alberta far and away dominated Canada's reserves of gas liquids. The province added 119 million barrels to its store of gas liquids even after using 2.9 million barrels.

Canada as a whole continued strong in natural gas. Explorers added 1.2 trillion cubic feet of gas by extensions and revisions and 795 billion cubic feet by new discoveries. Net addition to reserves after production of 277 million cubic feet was 1.7 trillion cubic feet.

U. S. Natural-Gas Reserves: Millions of cubic feet.

	Proved res. 1-1-57*	Extensions and revisions*	New disc.*	Change underg. storage†	Net production‡	Reserves 1-1-58	Change in reserves 1957
Alabama	.....	.....	.....	.....	.....	.....	.....
Arkansas	1,171,527	103,994	47,818	145	40,462	1,283,022	111,495
California	8,751,233	¶516,043	144,989	12,616	471,988	8,952,893	201,660
Colorado	2,422,769	40,381	55,244	1,385	139,100	2,380,679	—42,090
Illinois	219,705	—36,175	.....	2,085	19,243	166,372	—53,333
Indiana	33,772	.....	270	950	4,040	30,952	—2,820
Kansas	17,566,257	2,136,392	218,473	565	625,709	19,295,978	1,729,721
Kentucky	1,245,602	43,714	7,640	—2,911	69,000	1,225,045	—20,557
Louisiana	45,053,999	¶4,137,189	4,366,891	.....	2,122,125	51,435,954	6,381,955
Michigan	361,786	46,625	1,750	44,015	10,148	444,028	82,242
Mississippi	2,403,326	70,809	28,983	462	205,840	2,297,740	—105,586
Montana	696,351	649	957	4,324	31,831	670,450	—25,901
Nebraska	225,402	—9,014	1,734	.....	28,783	189,339	—36,063
New Mexico	23,472,707	—684,776	215,588	—1,684	743,826	22,258,009	—1,214,698
New York	85,249	3,200	800	7,249	3,116	93,382	8,133
North Dakota	397,493	193,105	170,232	.....	17,398	743,432	345,939
Ohio	853,607	49,900	8,850	21,718	32,261	901,814	48,207
Oklahoma	13,775,049	577,123	839,797	12,080	944,569	14,259,480	484,431
Pennsylvania	776,212	141,521	14,880	27,986	107,004	853,595	77,393
Texas	112,728,750	3,197,704	2,665,334	11,506	5,518,776	113,084,518	355,768
Utah	619,786	192,436	65,154	.....	18,082	859,294	239,508
Virginia	35,557	3,375	1,125	.....	2,536	37,521	1,964
West Virginia	1,561,737	131,686	27,960	23,524	183,977	1,560,930	—807
Wyoming	3,235,932	261,026	113,798	796	154,119	3,457,433	221,501
Miscellaneous	80,761	§1,412	726	12,922	8,426	87,395	6,634
Total United States	**237,774,569**	**11,118,319**	**8,998,993**	**179,733**	**11,502,359**	**246,569,255**	**8,794,686**

*Excludes gas loss due to natural-gas liquids recovery.

†The net difference between gas stored in and gas withdrawn from underground storage reservoirs, inclusive of adjustments and native gas transferred from other reserve categories.

‡Net production equals gross withdrawals less gas injected into producing reservoirs. Changes in underground storage and gas loss due to natural-gas liquids recovery are excluded. Fourth quarter production estimated in some instances.

¶Includes offshore reserves.

§Includes Alabama, Arizona, Florida, Iowa, Maryland, Missouri, and Nevada.

Gas-Treating Tool Pays Off

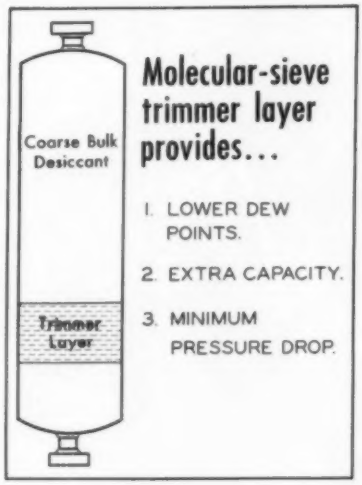
MOLECULAR SIEVES are making some gas-processing plants more efficient and more profitable.

The unique adsorbing material, a type of crystalline zeolites, is finding application in:

. . . Trimmer beds of drying units to supplement lower-cost bulk desiccants. The thin layer of molecular sieves provides lower dew points and higher capacities.

. . . Coadsorption systems. In one case, molecular sieves are drying sour natural gas while also removing the sulfur compounds. In another unit, water and carbon dioxide are being removed from an ethylene stream in a process competitive with liquid scrubbing.

These cost-saving applications were pointed out by E. L. Clark of Linde Co. at the recent gas-conditioning conference at the University of Oklahoma. Clark also noted that molecular sieves may have other applications.



What they are . . . Molecular sieves are crystalline sodium or calcium aluminosilicates. Their crystal structure remains intact when the water of hydration is driven off.

They have the ability to make separations based on molecular size. All adsorption takes place inside the crystal structure. Only those molecules are adsorbed which are small enough to pass through the uniform pores in the face of the crystal lattice.

Another property of molecular sieves is high adsorptive affinity for polar and unsaturated compounds. This means they can remove selectively such polar compounds as water, carbon dioxide, hydrogen sulfide, and mercaptans from streams of less polar compounds. They can also make separations based on degree of unsaturation.

Trimmer beds . . . The trimmer-bed approach has been developed because molecular sieves cost more than other bulk desiccants. They cost $1.50 per pound as compared with activated alumina at 35 cents per pound.

A compound bed of a dehydrator or adsorber is designed to use a less expensive bulk desiccant for 70 to 95 per cent of the bed depth. Molecular sieves are used for the rest of the bed.

With the less expensive desiccant taking care of the entering gas with high water concentrations and the molecular sieves providing high capacity in equilibrium with the partially dried gas, the net effect is lower dew points or drying at higher gas flow rates, or both.

Trimmer beds are being used in drying catalytic reformer hydrogen going to ammonia manufacture; drying of ethane separated at low temperatures; and drying of ethylene pyrolysis effluent.

Coadsorption . . . In one coadsorption system, molecular sieves removed water and carbon dioxide from ethylene containing 3,000 to 4,000 p.p.m. CO_2.

Investment and operating cost estimates were made for a four-stage monoethanolamine and caustic scrub followed by water wash and desiccant, and for a single-stage molecular-sieve process.

Direct investment was lower for molecular sieves. Operating costs were lower when service life of 1,000 cycles was assumed.

Another example of coadsorption is provided by an installation on a sour natural-gas well. Here molecular sieves are drying the natural gas well below specifications, while also removing assorted sulfur compounds reported as 42 grains of H_2S per 100 s.c.f. of gas.

In this case two 1,000-lb. beds are drying and sweetening 5 million standard cubic feet per day at ambient temperature and a pressure of 450 psig. Sulfur content of treated gas is also well below specification and is reported negative to lead acetate paper.

Top Industry Officials Called by Grand Jury

A FEDERAL grand jury at Alexandria, Va., has had a burst of activity in recent weeks during its investigation of the petroleum industry.

Ninety-five industry officials have appeared in answer to subpenas recently, 31 of them last week. Last year approximately 255 subpenas were issued.

The grand jury has shown much interest in crude and product price changes before and after January 1, 1957. The last general crude price increase came in January of 1957.

The jury's term expires early in June. If it does not complete its work by then, the investigation must be dropped or started all over again with a new grand jury.

Among those called recently to testify in the secret jury sessions were officials of Continental Oil Co., Esso Standard Oil Co., and Skelly Oil Co. The Esso executives were ordered to bring "copies of all memoranda written by you" between December 1, 1956, and January 31, 1957, "recommending any price changes for automotive gasoline" or relating to any price changes for crude or products.

Most of the major refining and marketing companies have testified recently before the grand jury. Twenty-four of them were asked to bring in documents relating to gasoline prices between specific dates, mostly in 1956 and 1957, in selected communities in Kentucky, Pennsylvania, Virginia, Missouri, Texas, and Iowa.

The same 24 were asked to produce documents about tank - wagon prices for gasoline, retail prices, dealer margins, dealer consignment and commission plans, assistance to dealers; and discounts, allowances, rebates, credit memorandum, and special rental agreements with dealers.

Sinclair Refining Co., in a separate subpena, was asked for copies of documents relating to its handling of crude and products from May 1, 1953, to July 1, 1953, and from September 15, 1956, to February 15, 1957. These periods cover the last two general crude and product price increases.

The grand jury received testimony in February from more than a score of companies concerning their officers, interests of officers in other companies, memoranda on crude oil and product prices, relations with the American Petroleum Institute and its Division of Marketing, and efforts since January 1, 1953, to develop a code of ethics in marketing.

NEW AAPG president, George S. Buchanan (right), vice president of Husky Oil Co., Cody, Wyo., discusses the AAPG convention with the outgoing president, Graham B. Moody, Los Angeles consultant.

Sagging Wildcat Record

. . . hit by SEG president. Geologists told to look to new areas and better techniques to bolster oil reserves.

O. C. CLIFFORD, Jr., Atlantic Refining Co., Dallas, president of the Society of Exploration Geophysicists, had some plain talk for the 2,800 geologists assembled in Los Angeles last week for the forty-third annual convention of the American Association of Petroleum Geologists and the Society of Economic Paleontologists and Mineralogists.

Clifford spoke to the group in its opening session at the Philharmonic Auditorium. As a profesisonal geologist and geophysicist, he was in a position to speak frankly from both points of view.

He decried the record of both groups in oil finding over the past 13 years in numbers of successful wildcats. He said oil finders have improved with the score jumping from 296 in 1944 to 795 in 1956, but percentages show a different picture.

Technically - guided wildcats that found success when related to total wildcat drilling declined from 12.3 per cent in 1955 to 10.9 per cent in 1956, for example, "and these successes are finding less and less oil," Clifford declared.

"The average successful wildcat uncovered 11.3 million barrels of oil in 1944. In 1956 this figure fell to 1.4 million." Over-all in the 13 years 1944 through 1956, 11.8 per cent of all new-field wildcats were hits. Out of nearly 60,000 tests 7,000 were successful."

Not only are we finding less and less per prospect but each prospect is steadily more expensive, Clifford pointed out. In 1946 the average cost per discovery was $500,000, but in 1956 the figure had risen to more than $700,000 per prospect.

"We are pricing ourselves out of the market," he cautioned the oil finders, "and exploration costs now amount to about half the value of the barrel in the ground."

What to do about it . . . More geological and geophysical cooperation is desirable especially in the stratigraphic search. But according to Clifford the two sciences still cannot pinpoint one particular sand at its optimum position for accumulation of oil or gas.

Two other ways to find oil are left for the future, the speaker declared. "The first is to discover a method of making measurements at or near the surface which will tell directly the presence of oil at depth, but this method is not remotely in sight.

"The other is to apply a decisive method to a new area. The success of this approach has been well demonstrated in the Illinois basin in 1938-40 and in offshore Louisiana in 1948-1955. Both uncovered tremendous new reserves."

"This is the early bird and worm philosophy of exploration," Clifford said, "and it presupposes the entry of early birds into territory inhabited by worms. But it should be directed at the practically undrilled basins of the western United States, at the unworked Continental Shelves and in Alaska."

As a word of caution to all explorationists Clifford scored a final blow: "Let us then be about our oil hunting with all the skill, intelligence, and determination possible, but let us not forget next time to tell the boss sooner when all the elephants are hunted out and only mice remain."

Bids Low in Texas

at big lease sale. Offshore acreage draws few takers.

THE TEXAS school land board is ruefully regarding its recent sale of oil and gas leases as something of a bust.

More than 60 per cent of the acreage up for bids went begging. And the high bonus bids submitted for the lands which were sought averaged a puny $45.37 an acre.

The per acre figure compares with

PROCESSING

Continental Oil Co. has a new type of steam boiler going into its Lake Charles refinery. Designed by Babcock & Wilcox, it will eventually tie into a gas turbine as a heat-saving measure. At first it will operate conventionally on a gas fuel, to make 180,000 lb. of power steam per hour. Later, when the gas turbine is built in the plant, the boiler will switch from air to turbine exhaust gas and reclaim the tremendous amount of heat which would otherwise be wasted in the exhaust gases.

Champlin Oil & Refining Co.'s new HF alkylation unit at Enid, Okla., has gone on stream 4 weeks ahead of schedule and is running smoothly. The 1,430-bbl. unit, which uses the Phillips process, will be a part of the company's 30,400-bbl. Enid plant. Engineering and construction was handled by Badger Manufacturing Co.

North Star Oil, Ltd., has awarded contract to Procon (Canada), Ltd., for construction of a new combina-

a $74.63-per-acre average for the last sale held in June 1957. And the results of that one were thought to be pretty dismal at the time.

All told, the board received high bids totaling $4,538,276 for leases on 100,028 acres of state lands. No bids were received on more than 152,000 acres of the 252,865 acres offered.

Humble Oil & Refining Co. helped to keep the sale's per-acre return from slumping much lower by offering the highest bonus bid of more than $2,000 per acre for 150 acres of the Red Fork River bed in Coke County, West Texas. The bid totalled $310,650.

Offshore acreage avoided . . . Bids were offered by oil operators on only 5 of the 41 offshore tracts up for lease.

There were no bids at all for 12 submerged tracts located beyond the 3-mile line offshore. The board put these up for sale to sample response despite the fact that operators had shunned the area beyond the 3-mile boundary in leasing requests.

The board blames the lack of enthusiasm for the offshore lands on the fight currently being waged between the federal and state governments in the Supreme Court over ownership of the area between the 3-mile and 3-league limits.

Gas, Oil Costing Motorist Less

THE AUTO OPERATOR is paying less for gasoline and lubricating oil this year than last, according to a survey made by the American Automobile Association.

The cost of gas and oil averages 2.39 cents a mile this year. It was 2.42 cents last year.

The AAA explained this savings occurred despite a one-third cent per gallon increase in the price of gasoline. It resulted because a 1957 six-cylinder, low-priced car reportedly averaged one-half mile more per gallon of gas than did a similar 1956 car.

The report found the national average is one gallon of gasoline needed for every 15.2 miles of travel.

The information was supplied to AAA by Runzheimer & Co., of Chicago, a research engineering firm which develops auto cost figures for auto fleet operators. The calculations are averages from 42 areas of the U. S.

Depreciation ($565 this year), liability insurance ($95.35), fire and theft insurance ($21.36), license and registration ($19.16) all are up this year over last for a total of $701.31. For last year, the comparable figure was $634.87, AAA found.

AAA said the fuel costs are based on average prices of 33.9 cents a gallon for regular gasoline in 1958 and 33.6 cents the year before. The actual price range was a top of 39 cents a gallon in Butte, Mont., to 29.5 cents in Chelsea, Mass.

The survey car is a six-cylinder Chevrolet, 210 series with heater and turn signals but no other equipment, not even radio. Retail price is on the order of $2,200. A 1957 model was used to obtain the 1958 figures and a 1956 model to obtain the 1957 figures.

The AAA explained that a higher priced automobile, with more equipment, insured for collision, and using more than the average gallons per mile would cost considerably more to operate.

Other costs also vary. Liability insurance, for instance, ranges from $21 a year in New York City to $46.92 in Dodge City, Kan. The AAA survey offered no variations on lubricating-oil costs.

BRIEFS . . .

tion UOP Platforming-Unifining unit at the company's St. Boniface, Man., refinery. Design capacity of the Platforming section is 2,700 bbl. The new unit is one of the first steps in a major expansion program at the 11,000-bbl. plant. Cost of the project will be more than $1,000,000.

Ashland Oil & Refining Co. will begin operations next month at its new aromatics plant at the company's Frontier Division refinery at Buffalo, N. Y. The plant, with capacity of 500,000 bbl. annually, will produce benzene, toluene, zylene, and heavier aromatics. Process designs, cost data, and several pilot-plant studies have been prepared for additional facilities to produce a variety of intermediates or feed stocks from aromatics, including cyclohexane, methyl cyclohexane, para xylene, ortho xylene, and maleic anhydride.

Continental Oil Co. is revamping a single-reactor reformer into a full-scale reformer to upgrade gasoline octanes in its 10,500-bbl. Billings, Mont., refinery. The present reactor has been used as a hydrodesulfurization unit to produce hydrogen. After the revamp, it will also produce about 1,500 bbl. of high-octane gasoline components. Refinery Engineering Co. of Tulsa has the construction contract.

Construction will start in June on an ammonia-recovery plant at Pryor, Okla. The new plant will recover 10 to 15 tons daily of ammonia now being vented into the air by Grand River Division of Deere & Co. Refinery Engineering Co. of Tulsa expects completion of the project in the fourth quarter of 1958.

A new asphalt plant is slated for completion by early April in Dawson Creek, B. C. It is being built by X-L Refineries, Ltd., subsidiary of Pacific Petroleums. The plant will produce about 350 bbl. of asphalt daily.

Also for Refiners . . .

IN THE NEWS: Sources close to the administration say odds still favor voluntary controls on imports (p. 77) . . . Texas' import-study commission will hold new hearings this week in West Texas in move to determine how much imports are hurting the state (p. 78) . . . The API estimates on domestic petroleum reserves are out. They show: Crude reserves down, gas-liquids reserves down, and natural gas up (p. 80) . . . Average cost of gas and oil for motorists has dropped this year, according to an AAA survey (p. 85) . . . Oversupply problem is proving critical to California refiners and producers alike (p. 86) . . . Refiners some day may remotely control production of oil fields hundreds of miles away. This may be possible through startling developments in communications (p. 89) . . . American oil interests have a big stake in outcome of Indonesian war (p. 98).

PLUS THESE TECHNICAL REPORTS: The Foreman's Page (p. 179) . . . Process Costimating (p. 190).

West Coast Is Plagued by Oversupply

Producers say:

- **"We're selling at distress prices on a day-to-day basis. When our tanks get full, we shut 'em in and then scramble around for a buyer."**
- **"We are selling our crude 47 cents under the posted price. It was the only way we could make a deal."**
- **"Our buyer said he wouldn't renew our contract unless we agreed to pay the shipping charges after this."**

Refiners say:

- **"We lost more money in December than we made the last 3 years."**
- **"Unless some relief is given the independent refiner from the competition of cheap foreign crude, we will be unable to survive."**
- **"We've had to cut our refinery runs 30 per cent, like most of the other independents in California."**
- **"The competition is killing us."**

CALIFORNIA'S independent producers and refiners are in trouble.

Cancellations of crude purchase contracts are showing up in greater numbers to harass the small producer. And the small refiner is bucking the worst oversupply of crude and products since before World War II.

Both producers and refiners claim that unless something is done soon, the small oil company in California will be unable to survive.

Both point to the big importer as the chief source of their trouble.

The background . . . Here's what has happened:

Last year, demand missed coming up to expectations in District 5 by a country mile. Economists figured the year for a 3 to 5% increase in demand over 1956. This prediction held up pretty well for the first half of 1957. And then came the toboggan ride.

Instead of the predicted rise, demand fell 7% in the last 6 months of the year. And the trend is continuing into 1958. January's demand was 12% below that of January a year ago.

A heavy drop in residual-fuel demand accounted for a good portion of the decline. The military cut purchases and exports fell. Natural gas made further inroads on the residual-fuel market in the Northwest at the rate of some 20,000 bbl. of fuel daily.

Gasoline held up. Demand for it met the predicted increase of 2.5%.

But the over-all demand dropped. And while this was happening, supplies were increasing 4.3% over 1956. The biggest contributor to oversupply has been imports, which jumped 46% over the previous year, while domestic production in District 5 fell 3%.

It was this combination of demand decline and supply increase that created the dangerous oversupply problem for the independent refiner and producer in California.

Petroleum stocks were at an 8-year record level of 145,400,000 bbl. at the start of February.

Excessive stocks touched off a gasoline price war more than 6 months ago. And the war is still on. One gasoline association is advocating state control of the entire oil industry in California as the only means of stabilizing business.

Producer's plight . . . Contract cancellations in California fields, which produce virtually all of District 5's domestic crude, have hit hardest in the Huntington Beach, Calif., Signal Hill, and Wilmington areas of the Los Angeles basin and at scattered points in San Joaquin Valley.

Small refiners are responsible for most of the cancellations.

The majors themselves have cut back their fully owned (fee-owned) production nearly 45,000 bbl. daily in recent weeks. At around 886,000 bbl. daily, California's production is at its lowest level since the Korean war.

Just last week General Petroleum Corp. asked independent producers it buys from to cut their production 10 per cent.

"We ask this as a temporary measure until we are again in a position to resume taking normal deliveries," Robert L. Minckler, General Petroleum president said.

The company already has shut in 10 per cent of its fee production and reduced Canadian imports to its Ferndale, Wash., refinery by 26 per cent.

Minckler pointed to the tremendous oversupply situation as the source of GP's troubles.

"Obviously we cannot continue to put either crude oil or products into storage indefinitely, and we are convinced that the best way to store and conserve our resources is to leave the crude oil in the ground," he explained.

Refiner's plight . . . The small refiner is in a worse bind than the small producer.

One small refiner put it this way: "We are trying to market a product manufactured from a $3 barrel of California crude in competition with products manufactured by importing companies using $2.25 imported crude."

"The competition," he said with finality, "is killing us."

George T. Goggin, president of the Independent Refiners Association of California, explained the problem of the Douglas Oil Co. of California. Goggin is the Douglas executive vice president.

"In November of 1956 we paid $2.44 a barrel for a certain California crude from which we manufactured housebrand gasoline which we sold for 13.1 cents per gallon," he said. "That same crude now costs us $2.96 a barrel, and we get only 11.25 cents a gallon for the gasoline."

SHUT DOWN by the soft products market is Fletcher Oil Co.'s 5,000-bbl. Wilmington plant. At least four others in southern California may follow.

What has Douglas done? It has cut refinery runs 30%.

Other independent refiners have reported similar experiences.

Sam Patterson of Bankline Oil Co. said: "We've cut our refinery runs one-third and have delayed indefinitely a major expansion program because of the current situation."

What to do? . . . Complications really arise when the producer and refiner start looking for solutions. While both blame imports, they would solve the problem differently.

The independent refiner, according to Goggin, should be allowed to obtain quotas on foreign crude to supplement his own production. This should be the case under either a voluntary or mandatory import control program.

"We should not be placed in the position of having to purchase any part of the domestic production under the importers' control," he said.

This complaint is voiced by other small refiners who say they must buy domestic crude at posted prices from the majors—and the same majors, in meeting their own crude requirements, replace the high-priced crude they sell with cheaper foreign crude.

The producers, while also blaming imports, have another solution. They would simply cut imports.

Richard Von Hagen, president of Lloyd Corp. and of the Oil Producers Agency of California, said importers "are inviting government control by their silence."

"There's a need for the importers to exercise some statesmanship," Von Hagen said. "The independent is puzzled why the importers aren't doing something about the problem."

This inaction, he said, is producing pessimism among the independents.

Actually, District 5 importers have kept substantially under their total quota in recent weeks. January imports averaged 162,100 bbl. daily, well under the quota of 220,000 bbl. And preliminary figures show imports in February were only 155,000 bbl. daily.

But the Oil Producers Agency believes that even 155,000 bbl. is too high. The organization recently petitioned Imports Administrator Matthew V. Carson to lower the District 5 quota to 130,000 bbl.

Crude prices . . . The producer and the refiner agree emphatically on one point: Don't cut the price of domestic crude. It would do more harm than good.

But there's real concern that this may be the very thing that happens. Some top executives of major companies have said recently that crude prices are 50 to 75 cents too high in California. And a broker in Los Angeles reports that plenty of California crude is going begging at prices up to 50 cents under postings in the field.

So far California has escaped the rash posted price cuts that have hit certain crudes in the Texas, Mid-Continent, and Tri-State areas. The question now is whether the posted price structure can continue to hold fast west of the Rockies.

Florida Gas Line

expects 409,000 customers by the end of third year.

THE PROPOSED natural-gas pipeline from South Texas to Florida is expected to serve more than 289,000 customers initially, with the total rising to 409,373 by the end of the third year of operation.

A report published by the Florida Development Commission points out that the combined projects of Coastal Transmission Corp. and Houston Texas Gas & Oil Corp. will cut the fuel bills of Florida consumers an estimated $14,566,418 the first year.

The report was prepared by James G. Richardson, associate professor of finance, and Aaron Teller, professor of chemical engineering, both of the University of Florida.

Besides providing cheaper fuel for domestic uses, gas also will open up new industrial opportunities in Florida, the report emphasizes. "Of particular note," it pointed out, "are several in the stone, clay, and glass industries and in the longer run perhaps the halogenated and fluoride chemicals."

Construction of the main line is expected to begin in late spring or early summer. Coastal has been authorized to build and operate the western part of the system, from South Texas to a point near Baton Rouge, with Houston Texas Gas & Oil continuing the system into Florida.

Yakutat Well Abandoned

COLORADO OIL & GAS CORP. has thrown in the towel at 11,765 ft. on its second wildcat effort near Yakutat on the Alaskan Peninsula.

The test, 1-A Yakutat, was a tight hole while being drilled, but Colorado indicated it would release some information soon. The well is about 8 miles east of the abandoned 9,314-ft. 1 Yakutat drilled last year.

Elsewhere in Alaska, Standard Oil Co. of California is considering a site for the first test of the Deep Creek Unit on southern Kenai Peninsula, about 50 miles southwest of the Swanson River Unit. Socal hopes to get approval from Interior's Bureau of Land Management to drill the well before the spring thaws set in. The unit covers 62,017 acres.

Humble Oil & Refining Co. is drilling another Alaskan test in the Wide Bay region of the Alaskan peninsula, about 240 miles southwest of Socal's site. The well is below 8,900 ft. on 1 Bear Creek Unit.

Pipelines Answer Charge

. . . of overpaying dividends under 1941 consent decree. They say methods used had prior approval of Government.

HOW BIG a dividend can an oil pipeline company pay its shipper-owners?

Arapahoe Pipe Line Co., which carries crude oil from Colorado to Kansas, says its fair dividend for 1957 is $2,109,000.

Department of Justice, however, says correct payment is $203,000.

Both agree their figure is the allowed return under the 1941 consent decree of pipelines under the Elkins Act. Here, oil lines agreed to limit their dividends to shipper-owners to 7% of valuation.

The question is: What is valuation?

Arapahoe claims the valuation of its line for purpose of the dividend is $2,900,000 of capital put up by its owners, Sinclair Pipe Line Co., and Pure Oil Co.; and, some $26,000,000 of capital borrowed from an insurance company.

Justice claims, however, the valuation must be based only on the capital which the owners put up. Loan money doesn't count.

That's the issue in the first challenge to pipeline dividends in the courts since the consent judgment was signed more than 16 years ago.

Fantasic switch . . . This week U. S. District Judge Richmond B. Keech, Washington, D. C., cleared away one more hurdle as the big case moves forward in the courts. He denied a motion from oil pipelines to dismiss the DJ motions.

Hearings before Judge Keech are to open March 24.

The case started October 11, 1957, when the Justice Department filed four motions with the court challenging the way four oil pipelines figure valuation and thus the limit of allowed dividends. The Arapahoe case is the main one. Millions of dollars for oil pipelines are at stake.

In a memorandum backing up its case last month, U. S. attorneys Alfred Karsted and Don M. Sticpter, said:

"It is clear that Arapahoe's owners are paying the tariff with one hand and pocketing a rebate with the other. They have received from the carrier a portion of their tariff payments measured by the value of property for which others than they have put up the money."

This week, Arapahoe filed its brief with the court. And 11 pipeline companies, given permission to enter as "parties of interest," filed a memorandum backing up Arapahoe.

Arapahoe called the Justice Department claims "a fantasy" and its theory "impractical to the point of absurdity." The company said the matter was settled years ago, and that the Government had approved the methods which Arapahoe now is using.

As an example of the "weird results" if the Government prevails, Arapahoe said:

"One of the defendant pipelines with a low debt ratio, large stockholder equity and ample credit, is planning to take the business risk of constructing a new pipeline from offshore wells along the Gulf Coast to a coastal refining center. The project will cost about $10,000,000, and all of this money will be borrowed by the pipeline company.

"Under the department's theory of the judgment, the shipper-owners of the pipeline would never be permitted to make one cent of profit from this venture. They would, according to plaintiff's brief, be perpetually enjoined from receiving any dividend from earnings on this new line because the entire value would be attributable to debt."

Arapahoe pointed out the dividend payments were based on advice of the Government. Now if the payments are declared excessive, the Government may collect three times their amount. The pipeline termed this "manifestly unjust."

Others protest, too . . . The 11 other pipeline companies in their joint memorandum filed with the court also declared the Justice Department is trying to reopen a closed matter.

They claimed the Government is bound by the 1941 consent decree and may not now repudiate it.

Signing the memorandum were attorneys for Magnolia Pipe Line Co., the Texas Pipe Line Co., Plantation Pipe Line Co., Shell Pipe Line Corp., Service Pipe Line Co., Great Lakes Pipe Line Co., Cities Service Pipe Line Co., Texaco-Cities Service Pipe Line Co., Texas-New Mexico Pipe Line Co., Continental Pipe Line Co., and Humble Pipe Line Co.

Also in the case are Interstate Oil Pipe Line Co., a crude oil carrier, and Tuscarora Pipe Line Co., a products line, both affiliates of Standard Oil Co. (N. J.). They jointly filed the motion to dismiss which the judge

PIPELINE BRIEFS . . .

Shell Oil Co. will build a 20-mile, 6-in. crude line from Vallecitos field in eastern San Benito County to the company's main Bakersfield-to-Martinez pipeline in Fresno County in the San Joaquin Valley. The line will have a 15,000-bbl. capacity and will cost an estimated $650,000. It will be completed by late July.

Alberta Gas Trunk Line Co., Ltd., has awarded contracts for most of its 1958 construction program. Piggott Construction, Ltd., Calgary, will build the 145-mile, 24-in. south lateral from the main junction north of Brooks to Pincher Creek field. The lateral includes 11 major canal crossings in the vicinity of Lethbridge.

Banister Construction Co., Edmonton, has started work on three Alberta Gas Trunk Line crossings of the Old Man, Bow, and Red Deer rivers. The company is ready to award contracts for 50 miles of 34-in. and 40 miles of 26-in. comprising the balance of the main line from the north lateral to Cessford field.

Transcontinental Gas Pipe Line Corp. will build a 150-mile, 23⅜-in. o.d. line from Leidy storage field in Pennsylvania to its trunk line to New York. The odd size pipe was purchased when the steel situation was much tighter than it is now. The steel company which fabricated the pipe happened to have plate available for this diameter but could not make 24-in. immediately. Bechtel Corp. has the contract for the project.

Union Oil Co. is expanding its microwave system by adding 14 stations and 390 miles to the 260-mile network.

One of the two new systems being installed by Radio Corp. of America will extend voice communications, telemetering, and supervisory-control circuits to the Oleum refinery at San Francisco, linking with the microwave network between Bakersfield and the company's Mulholland control center near Los Angeles. A second system will link Mulholland and the southern division pipeline head-

turned down. They also have asked the court to confirm valuation methods they use which are like Arapahoe's.

The Justice Department filed four motions last October against four pipeline companies. One of them, against Texas Pipe Line Co., has been concluded with the court's approval.

One motion naming Tidal Pipe Line Co. (owned by Tidewater Oil Co.), challenged the policy of including as valuation base property used by a carrier but not owned by it. Justice lawyers claim Tidal paid its owning company, $35,060 in one year, but that $20,776 of this was from property used but not owned, and thus not allowable.

The fourth motion, against Service Pipe Line Co., revolved upon the date to be used for valuation. Service included additions during the year in valuation, on a sort of "value-as-you-build" basis. The Government claims valuation at the end of the prior year must be used.

Service filed a brief this week insisting that its "pro rata" valuation method squares with the consent judgment. It added there was no "overpayment."

In fact it claims, "complete elimination of pro rata values from the 1955 report would have very substantially increased the total of dividends permitted to be paid in that year."

Push-Button Oil Production

. . . controlled by distant refineries may become possible through new developments in communications, instruments.

REFINERS, through startling communications advances, may one day remotely control production of fields hundreds of miles away.

This, though some time off, is a distinct possibility, according to E. W. Jenkins, Jr., Shell Oil Co., Midland, Tex.

The refiner could do this, Jenkins said, through use of communication links, together with associated telemetering, computer, and remote-control equipment.

Knowing how much and what kind of crude is needed to maintain desired refinery runs, a plant could use computers to set production allowables based on actual crude needs and, by remote control, make well and lease production conform to the calculated allowables.

Such a system would greatly reduce surface-storage costs. Leases equipped with automatic metering devices could telemeter temperature; gravity, and b.s. and w.-corrected volume of the crude to office computers, where royalty and production payments could be calculated and checks written automatically.

Precise control of crude production by the refiner was just one of the forward strides the Shell engineer feels oil communications may take in the future. He described this one and others in a paper presented last week in Fort Worth at the spring southwestern district meeting of the API Division of Production.

Mass data transmission . . . Another comer in communications, Jenkins thinks, is mass transmission of business data.

This advance revolves around electronic computer centers and opens up a whole new concept of oil-company management.

Raw data, such as stock inventories, vouchers, and payrolls, fed from field offices into computer centers, could be processed rapidly and the results given to management while the information was still fresh.

Management could then decide issues knowing that the basis for its decisions was the best available.

Thousands of dollars in interest on borrowed money alone could be saved, Jenkins said, if management always knew exactly what its financial situation was.

---

quarters at Santa Fe Springs, Calif. The equipment will operate in the 2,450-2,700 megacycle band.

United Gas Pipe Line Co. has FPC approval to build 203 miles of 30-in. line along its system between New Orleans and Mobile, Ala. The project includes 78.7 miles from near New Orleans to Hancock County, Mississippi; 38 miles from Harrison County to Jackson County, Mississippi; and 86 miles of short loops.

West Texas Gathering Co. has started delivering 25,000,000 to 28,000,000 cu. ft. of gas from Winkler County, West Texas, fields to Pioneer Natural Gas Co. at Pioneer's Goldsmith compressor station. The gas is gathered from 27 wells in Emperor Devonian and Ellenburger and South Kermit Devonian fields. The company plans to lay more lines to handle up to 190,000,000 cu. ft. daily as soon as the expansion is approved by the Federal Power Commission. The lines, treating facilities, and a gas-processing plant will cost an estimated $6,000,000 to $7,000,000.

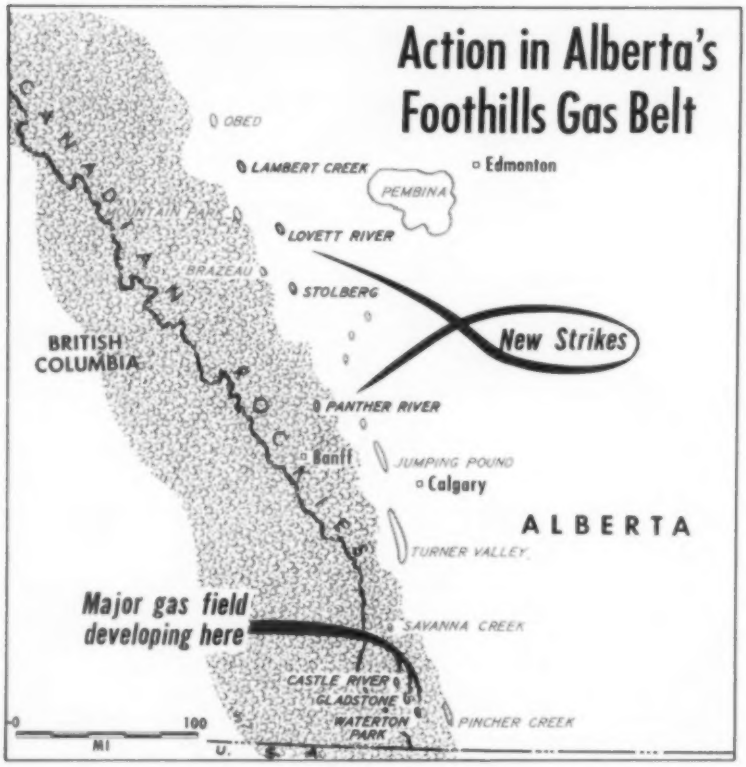
The Katy and New York Central railroads have set a target long-haul rate of 6.6 cents per barrel per 100 miles for their proposed 2,500-mile LPG pipeline. Under this rate, the haul from Houston to Albany, N. Y., would be $1.28 per barrel, far below the tank-car rate of $3.55. The railroads hope to complete the pipeline by November 1, 1959.

Magnolia Pipe Line Co. is replacing several small crude lines from Hull station to the parent firm's Beaumont refinery with 40 miles of 16-in. Panama Construction Co. has the contract and is expected to complete the project in late May or early June. Magnolia is moving around 40,000 to 50,000 bbl. daily through the southern system.

Also for Pipeliners . . .

IN THE NEWS: Four Corners Pipe Line has installed an unusual microwave system atop rugged New Mexico mountains. Helicopters flew in the delicate equipment (p. 79) . . . One of its sponsors says the Harris-O'Hara gas bill is doomed this session, but House Speaker Rayburn refuses to concede defeat (p. 79) . . . U. S. reserves of natural gas still climb while reserves of crude and gas liquids drop, according to latest API-AGA report (p. 80) . . . Pipelines reply to government charges they overpaid dividends under 1941 consent decree. Companies contend their payment methods were approved by the Government (p. 88) . . . New wildcat strikes mark sixth and seventh new-field discoveries in year in Alberta's Foothills gas belt (p. 90) . . . Justice Department refuses to give antitrust immunity to Peoples-Midwestern gas deal (p. 93).

PLUS THESE TECHNICAL REPORTS: New seagoing pipe layer is added to offshore fleet of tools (p. 180) . . . Pipeline construction report (p. 194).



Gas Trend Blossoming

. . . along Alberta's Foothills belt. Wildcat strikes mark sixth and seventh new-field discoveries in the past year.

ALBERTA'S prolific gas belt along the foothills of the Canadian Rockies has two new strikes to add to its list of successes of the past year.

The discoveries spotlight the big push in the region, which stretches from the U. S. border on the southeast to the British Columbia border on the northwest, an area of 13,300 sq. miles.

The wildcat successes are at Panther River and Lovett River, drilled by Shell Oil Co. and British American Oil Co., Ltd.

Shell's well at Panther River is a discovery of major importance. Located 28 miles north of Banff, it flowed Devonian sour gas at the maximum rate of 7,200 M.c.f. per day during tests at 9,009-9,166 ft.

The well is important because it produces from the Devonian rather than Mississippian, source of most of the fields in the Foothills gas belt. The well also is just inside the Rocky Mountains, thus moving the Foothills play into higher country.

BA's Lovett River wildcat reported a gas flow of 17,000 M.c.f. per day from the Mississippian below 10,000 ft. Total depth is 12,500 ft. The well is on acreage held by the Central Foothills Agreement Group, composed of Royalite Oil Co., Sun Oil Co., Triad Oil Co., and British American. Further tests are planned.

The group controls 14 separate reservations in a 1,300,000-acre block.

Old and new . . . The Foothills belt contains such major developed fields as Jumping Pound, Turner Valley, Savanna Creek, and Pincher Creek, and the newly developing Waterton Park-Castle River area, which may dwarf nearby Pincher Creek in importance.

The belt is one of Canada's most attractive future oil and gas provinces, although costs are hiked by deep and difficult drilling and expensive exploration programs in both the foothill and mountain areas.

Within the past year seven new fields have been found in the region. These consist of the two new discoveries at Panther River and Lovett River; three in the southeast at Castle River, Waterton Park, and Gladstone; Stolberg in the central sector; and Lambert Creek, near the northern limit of current production.

The Mississippian is the chief target of drillers because of its prolific success at Stolberg, Castle River, Waterton Park, and other spots. However, there is new interest in the Devonian because of recent discoveries at Panther River and at Lambert Creek. The Lambert Creek well went below 15,000 ft. to set a new depth record for Canada, and Shell is still drilling at Panther River.

A big one . . . The Castle River-Waterton Park area in the southeastern portion of the Foothills region appears to extend at least 17 miles from northwest to southeast.

Production is prolific from the Rundle Mississippian at 11,000-12,000 ft.

Texaco Exploration Co. hit this winter at its Castle River extension well and made 3,200 M.c.f. per day. The discovery extended the proven limits of the structure another 2½ miles northwest.

Further extensions of the area are expected to increase the reserves even more.

And elsewhere . . . A vast region of Foothills country still remains to be tapped along the east side of the Rocky Mountains.

The gas belt is expected eventually to reach the British Columbia border on the northwest.

Emphasis will be greater on the Mississippian prospects, but the recent Devonian discoveries will spur a further look at this thick section also.

'57 Demand Up 1.6 Per Cent

TOTAL DEMAND last year was 9,359,000 bbl. daily, up 1.6 per cent from 1956, the Bureau of Mines reported last week.

The increase was due largely to exports during the Suez crisis early in the year.

Domestic demand was 8,797,000 bbl. daily, a gain of only 19,000 bbl. daily.

Crude-oil production was reported at 7,175,000 bbl. daily last year compared with 7,151,000 the year before.

However, the added production went to storage. Total demand for domestic crude averaged 7,145,000 bbl. daily, down 5,000 bbl. daily from the 7,150,000 bbl. daily reported for 1956.

Crude runs to stills averaged 7,919,000 bbl. daily in 1957 and 7,937,000 the year before.

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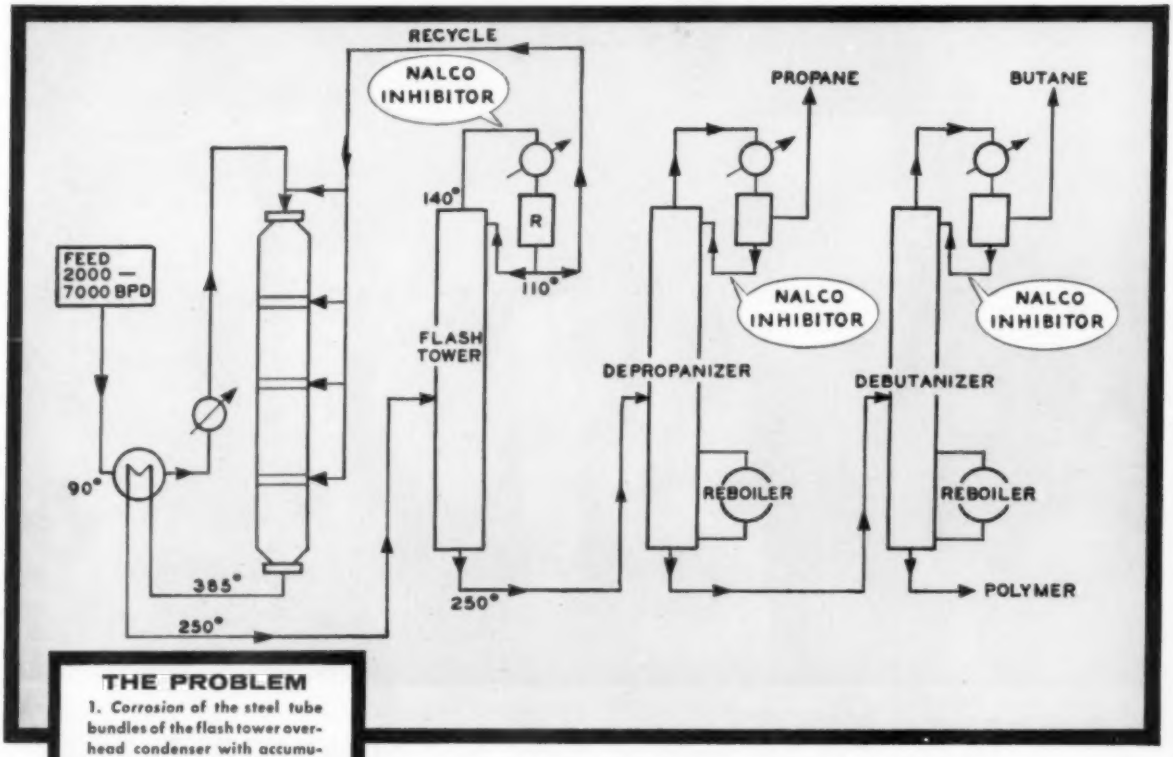

THE PROBLEM

1. *Corrosion* of the steel tube bundles of the flash tower overhead condenser with accumulator water pH of 4.5 or below.
2. *Serious fouling* of screen trays in the depropanizer and debutanizer on normal six-month run.

THE TREATMENT

Nalco Inhibitor fed to the overhead of the flash tower, and to the reflux of the depropanizer and debutanizer towers.

THE RESULTS

1. Iron content of accumulator water reduced from .75 pounds per day to .84 pounds per day.
2. No deposits in screen trays after six-month run.

CONSIDER further the economy of dosage . . . 10 ppm to flash tower, and 10 ppm to depropanizer and debutanizer. And bear in mind that this was no isolated success story. The same advantages—less downtime, better thruput *and* effective protection for costly equipment—can be brought to your refinery by the use of Nalco Corrosion and Fouling Inhibitors. Ask your Nalco Representative or write direct.

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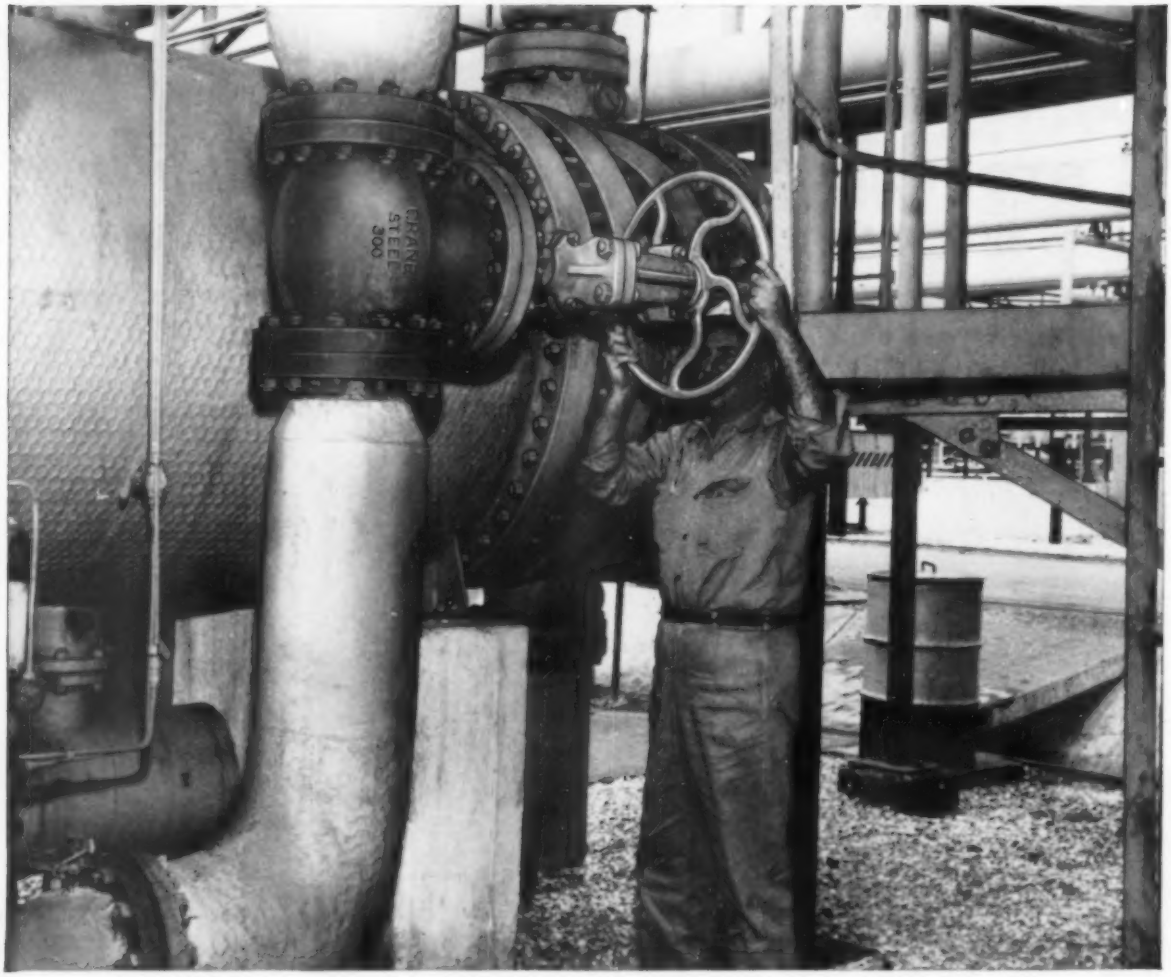
How Cit-Con stopped valve leakage in lube oil extraction



These Crane valves defy hot oil at 550° F.

You'll recognize smart planning in this valve installation at the Lake Charles, Louisiana, extraction tower of Cit-Con Oil Corporation, manufacturer of lubricants and waxes.

Before Cit-Con installed these Crane 8-inch No. 47X steel gate valves on lines to regulator, valves of another make were demanding frequent maintenance to cope with leakage of hot oil at 550° F.

The change to Crane completely corrected the problem. Why? Because Crane steel valves with Exelloy seating have those extra features that count in valve performance—better design throughout, finer workmanship and more thorough testing.

When you buy valves, you're wise to insist upon the engineering skill and quality manufacture you get when you order from Crane.

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Midwestern Gas Plan Blocked

. . . by Justice Department. But state to renew efforts for early expansion of gas service in the Chicago area.

THE JUSTICE Department last week refused to give advance clearance to a compromise plan to expedite construction of the proposed Midwestern Gas Transmission line from Portland, Tenn., to Chicago.

But the action doesn't necessarily mean the new Midwestern plan will not go through. George H. Perrine, chairman of the Illinois Commerce Commission, who got the disputing parties together to work out a compromise, planned renewed efforts to expand gas service to the Illinois-Indiana area this year.

At the urging of ICC, Peoples Gas Light & Coke Co., Chicago utility, had agreed to drop its opposition to Midwestern, a Tennessee Gas Transmission Co. affiliate which proposes to enter Peoples' market area (OGJ, Mar. 10, p. 90). But the agreement was contingent upon two things: Assurance from the Justice Department against antitrust prosecution and Midwestern's ability to start gas service this winter.

Problem and complications . . . Perrine says he is acting at the behest of Governor Stratton to step up gas service to the Chicago area, which has a waiting list of some 250,000 customers. Peoples' 1958 expansion program has been postponed until 1959 because of financing troubles growing out of the Memphis decision requiring prior customer approval of new rates.

Because of this delay, Perrine said he sought a solution to the deadlock which was delaying a decision on Midwestern, now awaiting an FPC examiner's decision. He saw Peoples' withdrawal 2 weeks ago as a happy solution to a complex situation.

The Justice Department position, set forth in a letter to Perrine and parties to the recent agreement, may upset this plan. The letter stated that the requested approval could not be given. It said that activities within the market area covered by the proposed agreement fell within the scope of the investigation of a federal grand jury in Milwaukee. The jury is probing the antitrust aspects of the battle over the Midwest market.

Renewed efforts due . . . Perrine, however, sees no possible antitrust violation in the deal under which Peoples got out of the Midwestern case or in the deal under which several distributors, including Peoples, agreed to purchase gas from Midwestern.

If anything, he regards it as evidence that there is no conspiracy to exclude competitors from bringing gas into Peoples' market area. He said his next step would be to call another meeting of the companies and encourage them to go ahead with the plan or work out some new agreement with the same goal: early expansion of gas service in the Midwest.

Midwestern proposes to build a line from Portland, Tenn., where gas would be received from TGT, to Emerson, Man., where Canadian gas would be imported for the Minnesota and Wisconsin section of the line. The northern section is opposed by Northern Natural Gas Co. and American Natural Gas Co. Midwestern would like to go ahead with the Portland-Chicago section, if FPC will approve, independently of the section based on Canadian imports. The availability of Canadian supplies awaits a report from the Borden Commission which recently completed a study of natural-gas reserves.

Phillips Negotiating

for new union contract at Borger; strike authorized.

NEGOTIATIONS for a new contract between the Phillips Petroleum Co. and employes at its plant in Borger, Tex., are under way. The present contract expires May 1, and union members have authorized a strike call at any time because of recent layoffs.

Phillips officials said 15 workers were laid off and 7 others transferred on March 1 from the butadiene section of the plant. Another 24 will be discharged April 1 unless transfers can be arranged. The total reduction represents 6% of the plant force.

The company also plans to lay off 39 workers at the refinery at Borger on April 1 unless transfers can be made.

The reduction at the Plains plant represents a return to normal staff after recent construction, Phillips said. The cutback at the refinery is necessary because of a shutdown of certain units resulting from a reduction in crude runs and adjustment of personnel to handle the anticipated workload.

The company hopes to transfer a majority of the affected workers to other plants in the Borger area.

Authority to call a strike was given officials of the International Union of Operating Engineers, which currently is negotiating with management for the new contract. L. V. McCarthy, business agent for Local 351, said 87% of the votes cast by Plains plant workers approved the strike call if needed.

Alberta Budget Cut

to fit expected income from oil operations during 1958.

A SLUMP in oil activity is putting a crimp in Alberta's finances.

Expected heavy reductions in oil and gas revenues has caused most of a $22 million decrease in Alberta's Social Credit government's proposed budget for 1958.

Provincial Treasurer E. W. Hinman said the government will spend $263,664,093 this year, $22 millions less than 1957's record budget.

The take from the province's oil and gas industries during 1958 is expected to total $103,050,000, a decrease of $18,469,000 from the $121,519,000 obtained last year.

Here is a breakdown of major aspects of expected oil and gas income, as compared with figures for 1957.

Government sales of crown leases will total $46,750,000, a drop of $15,250,000.

Royalties are expected to be $32,800,000, a decrease of $4,450,000.

Fees and rentals should total $23,500,000, an increase of $3,000,000.

Gas-Line Extension Studied

SIGNAL Oil & Gas Co. may extend the gathering system for its sulfur-extraction plant at Tioga, N. D., into the developing oil area near the Canadian border in Burke County.

R. L. Cook, plant superintendent, said a decision on the proposal is expected this spring. There are now 696 Nesson anticline wells on Signal's plant gathering lines in North Dakota.

Cook said additional Burke County gas, which is now being flared, could be handled with the $17,000,000 plant's present capacity of 65,000,000 cu. ft. per day.

About 45 tons of sulfur are being extracted daily from the approximately 45,000,000 cu. ft. of sour gas processed at the plant. The sulfur is marketed for about $25 a ton, principally to pulp and paper mills in northern Minnesota.

Gas Firm Makes Refund Offer

. . . to settle rate cases, avoid bankruptcy. Amount would be $8.7 million less than FPC examiner's recommendation.

COLORADO INTERSTATE Gas Co. is offering to refund $24,295,000 to its customers as a compromise settlement of natural-gas rate cases pending more than 4 years in the Federal Power Commission.

The Colorado Springs producer and pipeline firm has been collecting rate increases subject to refund since January 1, 1954. The impounded funds now amount to more than half of the company's total assets of $130 million.

Time lags in FPC rate case decisions have forced CIG to operate more than 4 years without knowing what its earning rate would be. The company last issued a stable financial statement to stockholders in 1954.

The total amount of the proposed refund to distributing companies would be for full settlement of natural-gas rate increases in 1954, 1955, 1956, and 1957. There would be an additional amount of refund for the period from January 1, 1958, to the date of settlement.

The sum offered is $8,704,605 below the $33 million refund recommended by FPC examiner Samuel Binder on May 8, 1957. However, CIG officials insist that if the company is ordered to make refunds in full and is denied higher rates it will be forced into bankruptcy.

The refunds . . . CIG would return approximately $9,346,000 to Public Service Co. of Colorado, which serves the Denver area; $1,406,000 to Pueblo (Colo.) Gas & Fuel Co.; $1,685,000 to the city of Colorado Springs; and $3,438,000 to the Colorado-Wyoming Gas Co., which serves northern Colorado and southern Wyoming.

A total of about $872,000 would go to a number of small communities in Colorado. An additional $7,125,000 would go to customers in Chicago, Ill., served by the Natural Gas Co. of America.

W. E. Mueller, CIG president, said the refunds represent elimination of a field price which would have been used to meet the cost of exploration and development of new reserves to replace the company's own produced gas. The price had been included earlier.

Mueller said also that income-tax deductions available to CIG on its own gas production are being passed on to the customers in its rate proposals.

Mueller was unable to say what the actual rates will be because this base price will depend on the outcome of current negotiations with the cities and distributing companies. A settlement may come by March 31.

CIG has put four rate increases into effect since September 2, 1953. The first amounted to $6,500,000, the second $10,269,000, the third $3,137,000, and fourth $2,553,000.

CIG decided to try negotiating rates with its customers after the U. S. Circuit Court of Appeals for the District of Columbia ruled in the important Memphis case. The court held that a company could not increase rates without consent of the gas-distributing customers.

Lube-Oil Decision

reached by FTC. Rerefined crude must be identified.

AFTER YEARS of study, the Federal Trade Commission has decided that the motoring public has "a marked preference" for lubricating oil made from virgin crude oil.

Three companies which take crankcase drainings and rerefine them into lubricating oil claim their oil is the equal of new oil, but the FTC said that even if this is the case, it doesn't matter.

"The public prefers oil made from crude" and the record is "clear and convincing on this score," said Commissioner Sigurd Anderson in one of three almost identical opinions. A majority of the commission backed him up.

Therefore, the commission told the three concerns distributing rerefined oil they must:

. . . **Show on the container** the oil is made from previously used oil.

. . . **Disclose this** in any advertising.

. . . **Halt affirmative claims** their oil is processed from crude oil.

The companies are among a parade of companies the FTC has complained against in recent years. They fought the complaint up to final commission order.

The commission orders affect Salyer Refining Co., Inc., Oklahoma City, and its president, B. M. Salyer, Jr.; Double Eagle Refining Co., Oklahoma City, and its officers, Frank A. Kerran and Cameron L. Kerran; and Mohawk Refining Corp., Newark, N. J., and its officers, John E. C. Stroud, C. Kenneth Johnes, and William L. Ashby.

Allowable Reduced

at big New Mexico pool as water production climbs.

THE NEW MEXICO Oil Conservation Commission has ordered a 24 per cent slash in allowable at the state's most productive pool because of rapid encroachment of water.

The commission has issued a temporary order reducing per-well allowables for Gladiola (Devonian) pool in northern Lea County from 237 bbl. to 190 bbl. daily.

The request for reduction was made by Ralph Lowe, Midland independent, after his 2 Lawton-State began producing 100 per cent water the latter part of February. Before that, the well had been capable of producing its top allowable since completion in 1956. Lowe has 24 wells in the pool.

Gladiola (Devonian) produced an average of 19,000 bbl. of oil daily in December, making it New Mexico's biggest. Dan Nutter, chief engineer for the commission, said the number of wells producing water in the pool has been increasing steadily the past 6 months. Production is from 12,000 to 15,000 ft.

Last autumn, when purchasers were taking only part of the allowable from the pool, pressure performance of some of the wells indicated that the lower rate of oil production would result "in additional ultimate recovery," the commisison said.

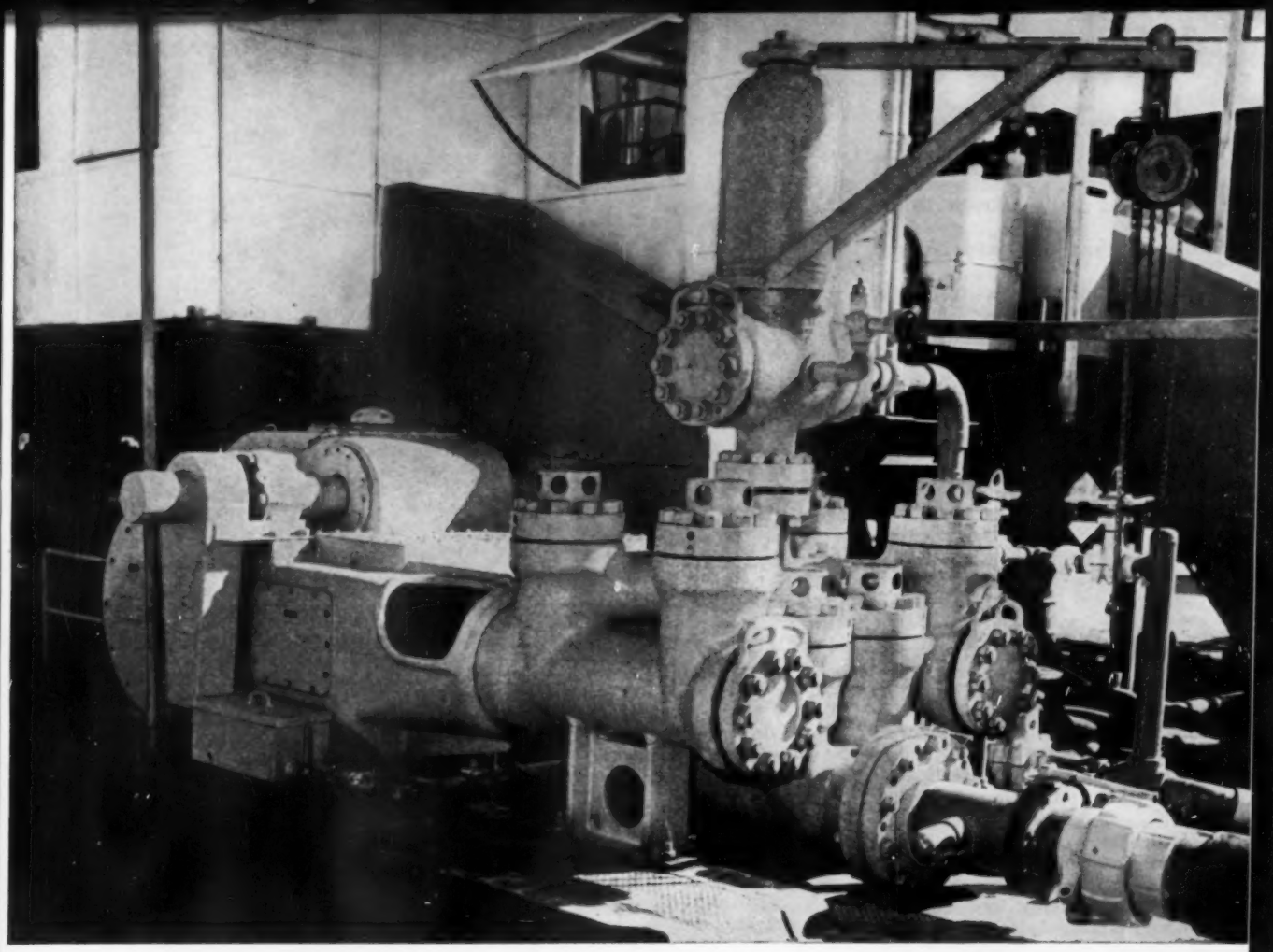
Lowe's geologists said the high production rate is apparently causing water underlying the oil strata to "cone up" into low-pressure areas around the well.

Storage Gas Flow Increased

A NEW push-button compressor station has boosted gas turnover from 33½ to 50 per cent at Hope Natural Gas Co.'s Fink and Kennedy underground storage fields in West Virginia.

The new setup at Sweeney station, 50 miles south of Clarksburg, has increased the flow by 10 billion cubic feet of gas annually. The two storages have combined capacity of 87 billion cubic feet.

The station is almost completely automatic, with push-button controls operating compressor engines and yard piping valves.



They Keep The Pressures High

Bethlehem slush pumps are built around the concept that fast drilling requires high fluid pressures—pressures that originate at ground level, within the pumps themselves. Hence you'll never find sluggish circulation with a Bethlehem unit on the job.

Today's rotary drilling requires high-speed jets at the bottom of the hole. By enhancing the cutting capacity of the bit, these jets increase the rate of penetration. But proper jet velocity is possible only when proper pressures are maintained. This condition is certain to be met when a Bethlehem pump is entrusted with the work.

Though Bethlehem slush pumps come in several sizes, there are certain mechanical features common to them all. These features include such items as flood lubrication of the power end (a flood activated with the *first* turn of the gears); high-capacity roller bearings throughout; tremendously strong all-steel fluid end with all parts easily accessible; and forged-and-rolled gear rim, which is replaceable in the field.

Bethlehem pumps are built for the toughest conditions ever encountered in modern drilling. They are designed right, built right. Before making another purchase, you are invited to study every detail of these units—a study in which our engineers will cooperate fully.

Bethlehem High-Pressure Slush Pumps

Model	Bore & Stroke	Input Hp
H-25	7¼ x 12	250
G-35	8 x 14	350
G-45	8 x 16	450
G-65	8 x 16	650
G-85	8 x 18	850
B-1640	8 x 16	1500

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Alabama's capitol at Montgomery is well known to oil men. They laid their problems before legislators and finally got some oil laws passed.

Conservation Story Sold in Alabama

LATE LAST MONTH the Alabama Oil and Gas Board approved 160-acre spacing for all zones which may be found deeper than the 10,850-11,500 ft. Rodessa in the state's big Citronelle oil field.

At the same time, Citronelle operators were hopefully awaiting a report, due soon, on whether they can water flood the Rodessa to halt plunging pressure, prolong field life, and hike oil recovery. (OGJ, March 3, p. 72). Unitization of the Rodessa, and likely the deeper prospective zones, too, is virtually certain if the report is favorable.

Behind these two developments is a story. And that, briefly, is that neither wide spacing nor unitization was legally possible in Alabama not many months back.

The fact that they are now is due to these three things:

. . . Citronelle, itself. Alabama as yet has few oil and gas fields. Citronelle is by far its biggest, and as such it was the object of extreme public interest. It also has been a problem field since its discovery in August 1955. Fast-sliding pressure made it obvious to field operators early in the game that there was an immediate need for spacing wider than 40 acres, that unitization likely would prove a must later.

. . . Alabama's oil dream. Alabama legislators for many years have witnessed the fruit stemming from oil capital poured into its neighbor states, Mississippi, Arkansas and Louisiana. They are eager to attract more oil attention to their state and eventually to see a thriving, prolific oil industry at home there.

. . . An intelligent industry effort, with Citronelle acting as a catalyst, to show legislators, royalty owners, and the general public what was needed and why.

1. The Situation

When Citronelle was discovered in 1955, Alabama conservation law fixed well spacing rigidly at 40 acres. The state's oil and gas board had no voice in spacing.

When this spacing law was passed in 1945, it wasn't unduly burdensome. Alabama's scanty oil production came from shallow fields. And the cost of drilling and operating the wells was low. An operater could afford to drill a well on a 40-acre tract and expect to make a reasonable profit.

Before Citronelle, only 10 wells had been drilled in the state to depths below 10,000 ft. And all of these were dry.

Citronelle, however, was a vastly different sort of bird. A well completed in the Rodessa costs $200,000 or more. Its Rodessa sands are erratic, both in location and thickness. What's more, they are tight. The drop in precious bottom-hole pressure since discovery has averaged a frightening 4 psi. daily.

Field operators soon were feverishly pushing pencils estimating per-well primary recoveries and payouts. In many cases, the answers didn't look good.

Wider spacing and unitization began to appear more and more essential.

Unitization, for Citronelle, like wide spacing, appeared out of reach under oil-conservation laws existing in 1955. The statutes authorized the oil and gas board to require "induction of gas or other substances for the purpose of repressuring such reservoir . . . or carrying on secondary-recovery operations." Further, they provided that "the board may require pooling or integration of tracts when reasonably necessary in connection with cycling operations."

Some authorities argued that these laws gave the board authority to require unitization of Alabama fields. Others interpreted them to mean that the board's authority was limited to cycling operations. In any event, its power was in doubt. And the industry considered the statutes too vague.

Unitizing a field is usually a wearying task anywhere. But Citronelle, with its hundreds of town lots and thus hundreds of royalty interest holders, figured to be a really tough nut.

Without some sort of concrete compulsory-unit law it appeared virtually hopeless.

This was the situation faced by Citronelle operators in 1955. And it appeared to them that their only feasible course was to get new, more-realistic conservation laws.

2. How They Did It

The operators had two things working for them.

One was that essentially all of them, big and little, saw the need for the new laws and were willing to work to get them.

The second was that they didn't have to start from scratch. Fortunately, Alabama legislators already

were thinking that the state might need new legislation to encourage oil activity. Meeting in regular session during the summer of 1955, just prior to Zach Brooks' Citronelle strike, the legislature created a 6-man interim committee to study modern oil exploration and development methods and recommend legislation to encourage development of Alabama's oil and gas resources.

The committee, headed by Sen. Neil Metcalf as chairman, already was hard at work when it became apparent that Citronelle had problems. In fact, the first committee-operator contact was established by the committee.

This was a godsend. Instead of being forced to go to the legislature with something to sell, the operators were in the much-better position of being asked what they felt was needed.

Hearings start . . . The industry quickly seized the opportunity. The operators, energetically helped by the Mississippi-Alabama division of the Mid-Continent Oil and Gas Association, furnished expert witnesses for the committee's first public hearings in the early fall of 1955.

The committee was given as simply as possibly the technical and economic reasons why Alabama should pass a unit law and give its oil and gas board the authority to set whatever spacing pattern it might find necessary for each individual field.

Between hearings, oil people told the same story to royalty owners, to business men in oil towns like Citronelle, and to the public generally. As one independent puts it: "We repeated and repeated our story—not just once but as many times as we had a chance to do so."

The critical hearings by the interim committee were held in January 1956 and the operators toted out their biggest guns. Along with the expert arguments from geologists and engineers, the committee heard testimony backing the operator position on spacing and pooling from bankers and members of conservation bodies in states where petroleum was better established.

Bankers explained to the committee how banking institutions finance oil development operations—how they weigh well costs against expected oil recovery before deciding on oil loans, and how well spacing vitally affects the cost-recovery relationship.

The committee was won over completely on all counts. In its report to the legislature on the spacing question it said:

"A statute which arbitrarily places a spacing limit is unsound. Until the restrictions are lifted, experienced wildcatters will shun the State of Alabama. The committee strongly recommends that the existing statute be amended so as to vest absolute authority in the board (oil and gas board) to fix the size of drilling units and the spacing patterns" for developing the state's oil and gas fields.

The committee took a stand just as strong for adoption of a compulsory-pooling law.

Royalty roadblock . . . Unfortunately, the industry's effort to educate royalty owners met with only partial success.

They, too, were won over on the unit question. But, at Citronelle especially, they fought stubbornly against wider spacing.

Despite one mass meeting and countless talks with the royalty owners and business men in Citronelle community, the operators were unable to shake the belief that wider spacing in Citronelle would cut royalty payments already watered down because of the multiple ownership of the town lots.

Bona fide Citronelle operators blame a few "fly-by-night" operators, too, for much of the spacing opposition. The latter came to town, made unrealistic offers to land owners, then left.

The Citronelle land owners became the backbone of a state land and royalty owners association formed to fight wider spacing at Citronelle.

The oil operators were at a disadvantage. They were essentially all outsiders, while the royalty and land owners were home folk and voters.

3. The New Laws

During a special session in the spring of 1956, the legislature passed a spacing bill. It was signed by Governor Folsom April 12, 1956. But it left a lot to be desired.

In effect, the bill was a compromise between desires of the royalty owners and the producers. It provided that the 40-acre spacing restriction remain in effect for all fields then producing in the state (including Citronelle's Rodessa pay).

For future discoveries, it permits the oil and gas board to set well spacing of up to 160 acres, with one restriction—that all new fields found at depths shallower than 9,990 ft. still be developed on 40 acres.

This law is of no help whatsoever to Citronelle producers and their Rodessa problems. But operators take some consolation in knowing that their spade work will benefit them later on—perhaps in deeper pays in Citronelle, certainly in undiscovered fields in other areas.

Sledding gets easier . . . The rest of the producer objectives came more easily.

During the regular session of the legislature last summer, operator witnesses testified expertly before joint hearings of the senate and house forestry and conservation committees in support of compulsory unitization and other needed conservation law changes of lesser importance.

This time they were supported by the royalty owners group as well as by the oil and gas board and the state geologist. The favorable testimony of the latter, Dr. Walter B. Jones, as to the urgent need for a unit law, scored heavily.

The unit bill passed unanimously in both houses and was signed August 23, 1957 by Folsom, who also steadily supported the producers.

The law, patterned after the 1951 Arkansas pooling statute, basically permits the board to require unit operation of all working and royalty interests in a producing area when 75 per cent of these interests have signed unit agreements.

The industry also won legislation healing other sore spots. New laws were passed calling for:

. . . A documentary stamp tax to be levied in lieu of the ad valorem tax on severed oil and gas mineral interests. This law has already proved valuable to the industry in lowering accounting costs, improving records, and establishing titles.

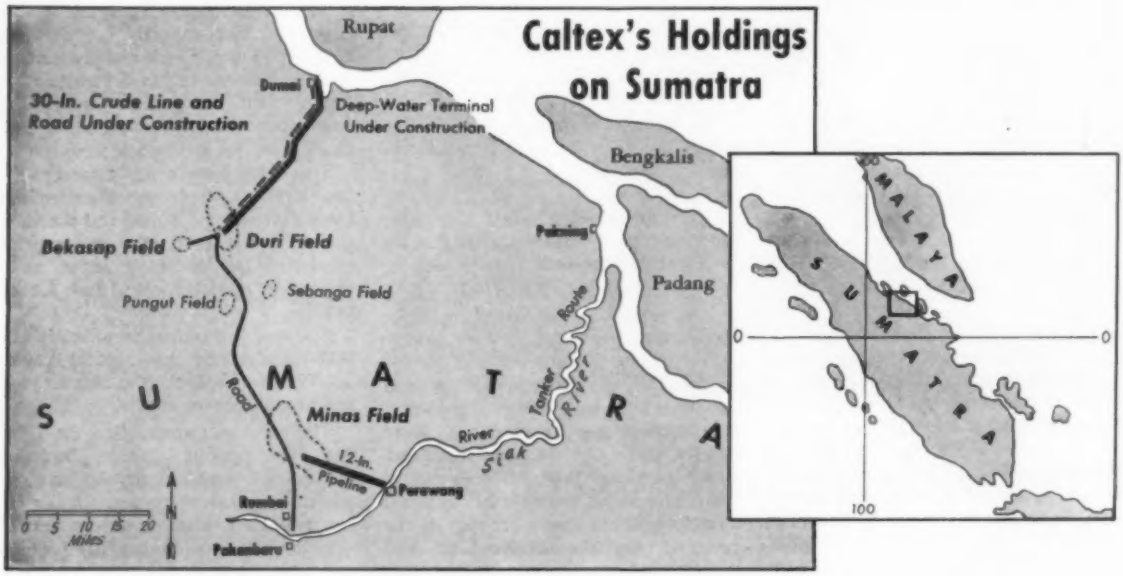
. . . A time limit on appeals from rulings of the oil and gas board of 90 days. There previously had been no time limit.

. . . A deadline for the state to accept or reject bids for leases on state-owned lands within 5 days after they are opened. Here, too, there had previously been no time limit.

Future moves undecided . . . The operators may again tackle the spacing issue when the legislature next convenes, but the wisdom of such a move is currently under debate.

Some of the producers feel that the industry has been with the Alabama legislators asking for something for several years and that it's now time to "give them a rest."

Others, however, feel it would be a big mistake not to move ahead immediately. The argument here is that the industry will have just one more session with the same legislature. After that, there will be a 30 per cent or so turnover in the membership of the legislature. And this, they say, would mean that the operators would just about have to start over from scratch with another exhaustive educational campaign.



Oil Has Big Stake in Indonesian War

Caltex families sent to Singapore, but some personnel is remaining at Rumbai. Production at Minas is shut down as government troops land in the area.

Road and pipeline construction from Duri field to new deep-water terminal is halted. Stanvac and Shell holdings are outside the firing area—so far.

THE LONG-SIMMERING rebellion against Indonesia's central government broke out in a shooting war last week with an American oil company caught right in the middle.

The military picture still had not jelled enough last week to determine just how serious a war it really is. But for Caltex Pacific Oil Co. it is getting to be an old story. Caltex had to pull out of the same area ahead of the invading Japanese in the early 1940's. Then there wasn't too much to leave behind. This time one of the world's richest oil fields is at stake.

At the end of the week the fighting had not spread to South Sumatra, where Standard-Vacuum Oil Co. and a Royal Dutch-Shell company have producing fields and personnel. Both companies are prepared to shut down operations and evacuate their people if it becomes necessary.

Central Sumatra's anti-Communist politicians and military leaders have long smarted because wily President Sukarno welcomed the Reds into his Djakarta government on populous Java and operates it largely with oil revenues from Sumatra.

For months the Sumatrans have tried to break their economic ties with the Java government and keep some of the revenue at home. A month ago they delivered an ultimatum to Sukarno to get rid of the Communists or they would set up a rival government.

Consequences . . . When the president ignored the ultimatum, the dissident government was set up February 15 at Padang on Sumatra's west coast. The rebel premier, Dr. Sjafruddin Prawiranegara, called on both Caltex and Standard-Vacuum to quit sending oil revenue to Djakarta.

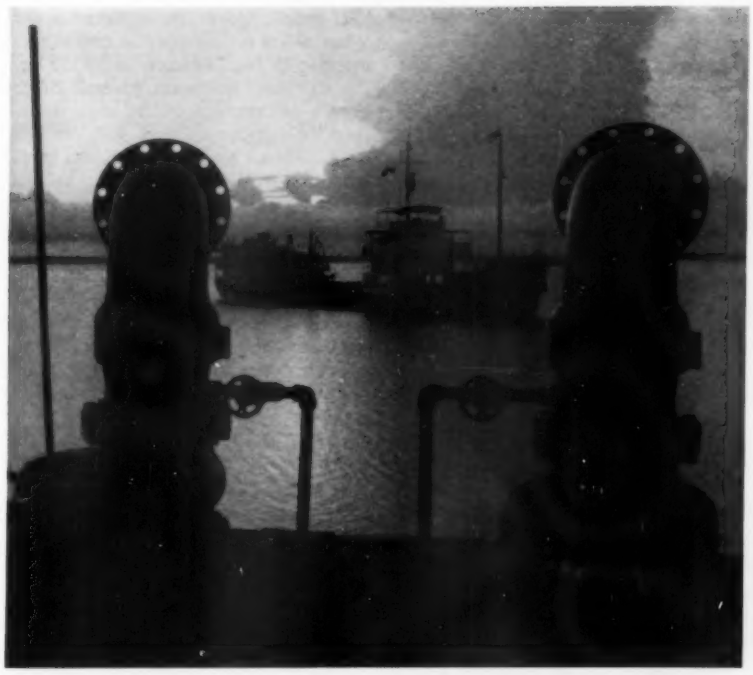
This brought the most decisive action from Sukarno that the world has seen in months. His air force made a few token bombing raids on Sumatra. His fleet moved up the West Sumatra coast and shelled Padang. Then government troops landed.

By late last week, here's what had happened:

. . . Paratroops from Djakarta landed unopposed at the Pakanbaru airfield in the heart of the rebel country. This is only a few miles from the main Caltex camp at Rumbai and is only about 10 miles from Minas field.

. . . Government troops landed on the island of Bengkalis in the Straits of Malacca off Sumatra's east coast. A small rebel force on the island, an old smuggler's stronghold, fell back and the government forces took over the Caltex terminal at Pakning on the main island just across the mouth of the Siak River. Pakning is the main shipping point for the Minas production.

. . . Landings of more government forces were expected at any time at Dumai, where Caltex is now build-



RIVER TANKERS such as this have sailed for Singapore with oil company personnel. Caltex had 13 of them moving Minas crude down Siak River.

ing a new deepwater terminal to take big tankers.

... **More troops** were expected to make landings flanking Padang, the rebel capital on the west coast.

Oil target . . . Big Minas field, which Caltex is developing just as quickly as it can, is the prize for both the rebels and the government forces. The oil company has been assured by both sides that every effort is being made not to damage the field, or its installations, and civilians are going to be protected.

The rebel government says it will fight to keep the oil field from falling into the central government's hands. Dr. Sjafruddin warned he would take "drastic action to keep this from happening.

"We won't blow up the wells, but there are other means," he said last week.

In the face of assurances from both sides, Caltex moved cautiously last week. It's hard to produce an oil field in the middle of a battle, so the company shut down all operations.

Here's what Caltex has done:

... **Families** of Caltex personnel at both Dumai and Pakning have been moved to Singapore.

... **All thirteen** of the river tankers which moved the Minas crude down the Siak River from Perawang to the Pakning terminal have been sent to Singapore.

... **All other Caltex employes** have been moved from the field to the big camp at Rumbai. Company officials said last week they have about 150 Americans and their families in the area. The company employs about 4,000 Indonesian workers.

What's at stake . . . The Central Sumatra holdings now being menaced by the fighting are easily the most valuable properties of the big group of Caltex companies, owned jointly by Standard Oil Co. of California and The Texas Co.

No dollar figure has even been put on the Sumatran properties, but they are estimated to be worth well over $125 million. The company is now in the middle of a $50-million spending program to increase the area's oil production even more.

This includes a 30-in. pipeline to link the northern fields at Duri and Bekasap with the new terminal under construction at Dumai. Bechtel Corp., San Francisco, is building the pipeline and a two-lane road paralleling the line.

Ironically, this road will be the last link in the only road system all the way across Sumatra. The road itself has commercial possibilities, to say nothing of its military value. Roads from Bekasap and Duri fields southward to Minas, Rumbai, and nearby Pakanbaru were all built by Caltex. The only existing road west from Pakanbaru to Padang on the island's west coast is a rough 200 miles of crudely constructed thoroughfare.

Oil development . . . Caltex had two rigs running at Duri developing the field's shallow 800-ft. Miocene reservoir to feed the new pipeline. The company has been completing about 16 new wells a year at Minas and steadily increasing the prolific Telisa Zonean, a Miocene sand reservoir found at about 2,500 ft.

Duri is not yet on production, but Minas could probably produce 200,000 bbl. daily if it were needed, far more than any other producing field in Indonesia. Minas production fluctuates, depending on the availability of tankers to take the crude. Last year it averaged 146,000 bbl. daily and had a peak production of 183,000 bbl. daily in October.

All the Minas production is moved to the Siak River by pipeline and then downriver on the 13 river tankers which shuttle back and forth from the Perawang terminal to Pakning. If Duri and Minas are linked by a large-diameter pipeline in the future, the flow of the crude would be reversed and sent directly to the deep-water terminal at Dumai.

But, that will have to wait until the shooting stops.

Maracaibo Well

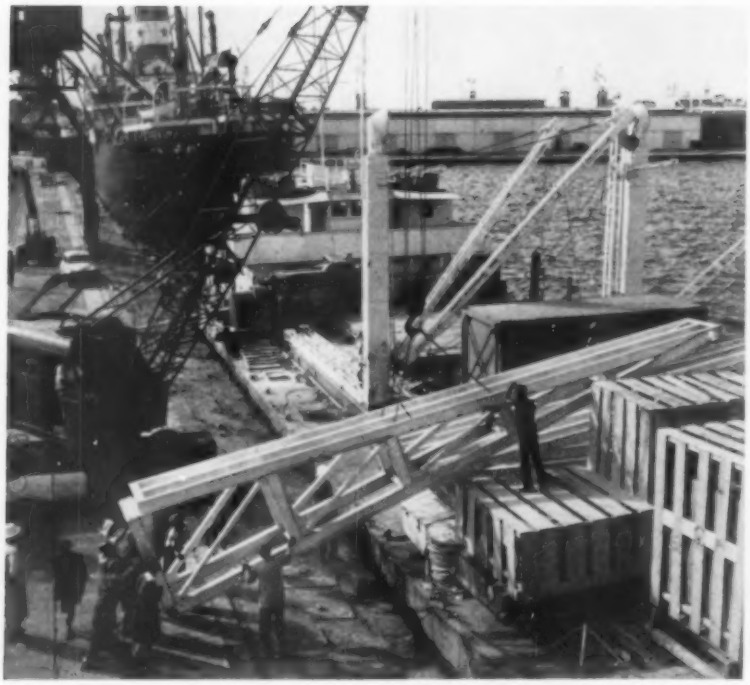
has heavy flow in Block 4. Firms will build terminal.

THE FOUR-COMPANY group drilling on Block 4 in Lake Maracaibo has brought in Centro Lago 4-X as its best well to date with a flow of 5,138 bbl. daily through a ¾-in. choke.

The well flowed 27.5°-gravity crude from Eocene C-2 sand through perforations from 10,044 to 10,200 ft. The depth was shallower than either the 2-X or 3-X drilled further north on the 28,000-acre concession. No. 2-X tested the same sand at 2,500 bbl. daily through a ⅝-in. choke from 12,113-93 ft. The 3-X flowed 3,000 bbl. daily from 11,807-12,184 ft.

Pure Oil Co., Signal Oil & Gas Co., Standard Oil Co. of Ohio, and Hancock Oil Co. own the concession. They will now deepen Centro X-1 to the C-W sand. The well was suspended last summer at 9,470 ft.

The group plans to start commercial production from the block late this summer when a terminal will be completed on the west shore of the lake at Punta Palmas. The second drilling barge is due to arrive next month.



French, British to Drill Senegal Test

STE. DES PETROLS du Senegal is shipping a rig into French West Africa for its first wildcat on a 15,625-sq.-mile concession.

The section of derrick (photo) being eased onto a former landing craft at Dakar is part of a rig brought in from Iraq for the test. The outfit is being reloaded onto the smaller vessel for transshipment to Balandine about 140 miles down the Atlantic Coast.

The rig will be set up at Casamance in the southern half of a two-part concession in Senegal. British Petroleum Co., Ltd., has 50 per cent interest in the operating company. French interests own the rest

Acosta New Venezuelan Envoy

VENEZUELA lost no time in naming a new man to the important post of petroleum attache at its embassy in Washington.

Dr. Eduardo A. Acosta is expected to arrive in Washington this week to take over the duties of minister counselor of petroleum affairs.

He succeeds Dr. Carlos Perez de la Cova, who has returned to Venezuela as the new head of the ministry of mines and hydrocarbons (OGJ, Mar. 3, p. 68).

The new attache, like Perez de la Cova, has an intimate knowledge of the oil industry on the field level. He also has personal contacts among U. S. oil men. These qualifications should further reassure U. S. oil circles about the future of the industry in Venezuela under the new government.

Background . . . Dr. Acosta graduated from Venezuela's Central University in 1940 with a degree in civil engineering. His first industry experience was with Creole Petroleum Corp. as a trainee in Jusepin.

He attended the University of Texas from September 1941, to August 1943, where he took a post graduate course in petroleum engineering on a Creole scholarship.

After returning to Venezuela, he worked in Creole's petroleum engineering section in Maracaibo for a year. He then resigned to become the government petroleum inspector at Mene Grande and Lagunillas, where he also remained a year. Since then, he has held several government posts dealing with oil and oil conservation.

During later trips to the U. S., Dr. Acosta delivered a paper on Venezuela's oil and gas conservation at the 1951 Interstate Oil Compact Commission meeting in Little Rock. He also gave a paper on aspects of the Venezuelan oil industry at the IOCC meeting in New Orleans in 1953. Dr. Acosta also prepared several other papers in Spanish which were delivered in Venezuela.

Dr. Acosta set himself up as a consultant early last year when he joined Consultores Asociados, an association of consultants with offices in Caracas. His clients included Superior Oil Co., Conorada Petroleum Corp., and Cerro Principe.

He has been president of Petroservicios Consolidados, SA (Petrocon), a firm organized with U. S. backing last October to lease marine equipment on Lake Maracaibo. The government recently named him a director of Venezuela's petrochemical program.

Extension Planned

for Israel's crude pipeline. Completion due by midyear.

ISRAEL PLANS to extend its Gulf of Aqaba-Mediterranean crude pipeline to Haifa refinery by midyear.

The system will be completed by the addition of a 90-mile section running northward along the Mediterranean Coast from a terminal at Ashdod Yam. Pipe of 16-in. diameter will be used. The existing line is 8 in.

The first section, extending 135 miles from Elath north to Beersheba, was opened last April. It was crash-built after Aqaba waters were opened to Elath-bound ships following the invasion of Egypt. A 35-mile extension to the Mediterranean was added later last year.

A line of this size could possibly fill local needs of less than 20,000 bbl. daily, all of which is now refined at the 85,000-bbl. Haifa plant. Israel has imported most of its crude from Venezuela since the Arab-Israeli war in 1948. Iran is believed to be the source of crude delivered to Elath.

Iran Oil to Pay for Dam

IRAN'S OIL revenues will finance one of the highest dams in the Middle East.

A 620-ft. high dam will be built in a mountain canyon 150 miles north of the Persian Gulf within 4 years. The project is part of the program of Plan Organization of Iran, which was set up to use 60% of the country's oil revenues for economic and social development.

Development & Resources Corp. of New York provides administrative and planning services.

PARIS DISCOVERY nears completion, and rig will be moved as . . .

French Plan Confirmation Test

THE PRIVATE French company that brought in a discovery 27 miles east of Paris has changed its plans for drilling on the structure.

The company, Ste. de Recherches Petrolieres dans la Region Parisienne (Petrorep), at first planned to carry Coulommes 1 to 10,000 ft. But it has decided to bottom the hole at 6,888 ft. and move the rig to a stepout location. Development drilling will begin immediately. Last week, the discovery well was drilling ahead at 6,724 ft.

The discovery will be put on commercial production as soon as tests are completed. A 75-ft. pay zone was encountered last month at 6,060 ft. Fifty barrels of light crude was recovered on a 75-minute drill-stem test. But the well will probably be produced at a much lower rate.

Chief significance of the find is that it is the first discovery in the big Paris basin, which covers most of northwestern France. The well is 5 miles southeast of Meaux near the center of the basin. The flow came from Dogger section of Jurassic lime, a good producing formation in West Germany (OGJ, Mar. 3, p. 85).

ASME To Publish Soviet Developments

AMERICAN SCIENTISTS will soon have access to the latest Soviet scientific developments through the translation of a leading Russian technical journal.

The American Society of Mechanical Engineers will publish the Soviet "Journal of Applied Mathematics and Mechanics" on a regular basis under a $35,000 grant from the National Science Foundation. This is the first such undertaking by the society.

Known in Russian as "Prikladnaya, Matematika i. Mekhanika," the magazine contains the latest theoretical and practical advances made by Russian scientists in mathematics, fluid dynamics, and solid-state physics. ASME has made arrangements with Russian scientists for advance proof sheets of the publication.

About 2,500 copies of the first 1958 issue will be printed. Copies will be sold by subscription at an annual rate of $35 for the six issues.

ASME said the translation is "an attempt to correct the present situation in which the Russians are familiar with the content of most, if not all, of our technical publications, while only a few of theirs are translated for use by the English-speaking world."

The society also said it "serves to underline the universal nature of science and engineering, and to emphasize that in these fields there are no natural boundaries between nations."

Iran Opposes Pact

between Bahrain and Saudi Arabia on offshore drilling.

THE RECENT offshore agreement between Saudi Arabia and Bahrain drew some fire last week from Iran, which has long claimed Bahrain as its own.

Aligholi Ardalan, Iranian foreign minister, said in Teheran that his government repudiates any such agreement. Ardalan said Iran regards any move by a foreign country or an oil company with regard to Bahrain's offshore rights as an encroachment of Iran's rights.

The whole question came up after a state visit by the Shaikh of Bahrain to Saudi Arabia when the two independent Persian Gulf kingdoms came to terms on the waters that lie between them (OGJ, Mar. 10, p. 102).

The agreement defines in part the frontier between the two and gives Saudi Arabia the right to exploit any oil found under the dividing waters of the Persian Gulf. Bahrain would share in half the profits from any oil found in this region without giving Saudi Arabia a full claim to the area.

Third Denmark Test Drilling

THE STANDARD OIL CO. (N. J.) subsidiary that took over a concession covering Denmark last year has drilled two dry holes and is now on its third test.

Danish American Prospecting Co. is drilling ahead in Fjerritslev 2, on the west coast of Jutland 25 miles west of Aalborg. It is down dip on the east flank of the structure.

Fjerritslev 1, about 1,000 ft. to the northwest, was bottomed at 3,015 ft. in basal Jurassic.

The first test, Vemb 1, was located 10 miles inland from the west coast of Jutland, due west of Randers. It was abandoned in Triassic at 6,440 ft. There were no shows.

French Refining to Move Inland

. . . on large scale. New company will build crude line and refinery at Strasbourg. Shell plans 60,000-bbl. plant.

PLANS for a major pipeline system running north from the Mediterranean and two new refineries at Strasbourg will give the French refining industry a new look in 2 to 4 years.

The formation of a new pipeline company by Cie. Francaise des Petroles, Pechelbronn, S.A., and other interests is the latest step in making inland refining economic in the country. At present, the French processing industry is concentrated along the Atlantic and Mediterranean coasts.

The new company, Ste. du Pipeline de la Raffinerie de Strasbourg, will build a line to supply a 70,000 to 80,000-bbl. refinery that will go on stream at Strasbourg in 2 to 3 years. A Royal Dutch-Shell subsidiary probably will feed from the same line for a 60,000-bbl. refinery it plans to put on stream near Strasbourg by 1962.

Presumably, Ste. du Pipeline will build a 190-mile feeder line branching from a big-inch trunk at Chalon-sur-Saone. But it also may have an interest in the 260-mile main-line section running northward from Marseille (see map).

Another company, Omnium Francaise de Petroles, has already made firm plans for a 60,000-bbl. plant near Chalon (OGJ, Jan. 20, p. 101). The

refinery, to be called Raffinerie de Bourgogne, will be open in 1961. It will be the first step in the system that may eventually lead to the North Sea at Rotterdam.

Omnium Francaise planned for a 22-in. line to handle its own needs. But with the extension to Strasbourg now definite, the pipe size may be reconsidered. Several companies working under the name Sappeur are studying a 650-mile, 30-in. pipeline system from Marseille to Rotterdam. Feeders would extend to Paris and Antwerp, as well as to Strasbourg.

Nasser Says Syrian Pipelines Are Safe

EGYPT'S Gamal Abdel Nasser moved last week to assure both the monarchs of the Middle East and the western world that oil will flow unhindered through Syria's pipelines.

A spokesman for the Nasser regime, which only recently absorbed Syria in an Arab federation, said interrupting the flow of oil from Iraq and Saudi Arabia would be "unthinkable."

"Under no circumstances will the pipelines be molested," the spokesman said flatly.

The statement was obviously made to allay the fears of Arab nations who have so far shunned Nasser's ambitious Pan-Arab union and have become the target of an intensive and abusive propaganda campaign as a result. It also was interpreted as proof that Nasser wants nothing done to encourage any western world interference in his political plans.

Both Middle East and West last week remembered the emotional seizure of the Suez Canal and the sabotage of the Syrian pipelines little more than a year ago and were inclined to take the statement with a grain of salt.

Chile to Expand Refinery

ENGINEERING DESIGN is completed for the expansion of the 20,000-bbl. refinery of Empresa Nacional del Petroleo at Concon, Chile.

The expansion will include a 24,000-bbl. atmospheric and vacuum distillation unit, a 12,000-bbl. Orthoflow fluid catalytic cracker and gas-recovery unit, a 6,000-bbl. catalytic desulfurization and reforming unit, and a 1,100-bbl. alkylation unit.

W. M. Kellogg has the contract for process, mechanical, and design engineering and procurement. A subsidiary, Kellogg Pan American, will provide supervisory personnel during construction and startup. ENAP will handle actual construction.

——— *World* briefs

The largest tanker in Venezuelan registry, a 16,485-tonner, will be delivered soon to Creole Petroleum Corp. Two 35,000-ton ships will be ready in 1959, and two more in 1960.

The Iraq Government estimates that it has lost nearly $160 million in oil revenue as the result of sabotage to its pipeline system in Syria. Pumping stations on the line were blown up 17 months ago in retaliation for the invasion of Egypt.

Esso Standard S.A.F. has awarded a design and construction contract for new facilities at its 85,000-bbl. refinery at Port Jerome, France, to Foster Wheeler Corp. New units will include a detergent alkylate plant, a chemicals plant to produce ethylene, butadiene, and other raw materials, a lubricating-oils additives plant, and propane-dewaxing expansion.

BP Exploration Co., Ltd., may have found two more small fields in the British midlands. Promising wildcats were drilled at Langar and Bothamsall, a few miles from present production.

BP Exploration Co. has reached an agreement with the Maltese Government on a new 5-year exploration agreement in Malta. Past work on the 95-sq.-mile island has included surface studies and structural drilling.

The oil marketing facilities of Union Oil Co. of California in Central and South America and the Caribbean area have been taken over by Gulf Oil Corp. The new Gulf subsidiary will operate under the name of Gulf Petroleum, S.A., with headquarters in Panama City.

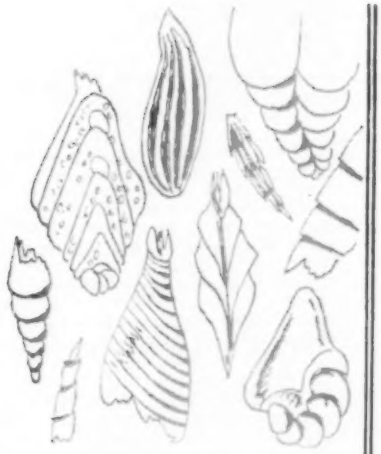
Production of high-impact polystyrene plastic will start in May at a new plant nearing completion at Rhodes, N.S.W., Australia. The plant is being built by C.S.R. Chemicals Pty., Ltd., of Australia.

A Houdry dehydrogenation unit to produce butadiene will be built in Japan by Japanese Synthetic Rubber Co., Inc., a recently organized firm which plans to establish a synthetic-rubber industry in Japan. The unit will supply butadiene to a rubber plant planned in the Yokkaichi area. The Houdry unit will produce 25,000 tons of butadiene annually. The plant at Yokkaichi is tentatively scheduled to go on stream in 1960.

Special

BEGINNING **EXPLORATION**

Section



FEATURING . . .

- 16 maps showing U.S. oil and gas fields
- Report on 1957 wildcatting in U.S. and Canada
- Report on 1957 seismic activity in U.S. and Canada
- How gravity surveys map oil fields
- Seismograph can pin point strat traps
- A look at southern Oklahoma's Ordovician possibilities
- How color aerial photography helps find oil

Plus

New Journal Oil and Gas Maps

A 16-page section, in color, of principal producing areas in the United States

A MAP is the oil man's identifying badge. He may be caught without his hat, his coat, or even his wallet, but you'll never catch him without his map. It may be an expensive linen item or merely a sketch on a paper napkin, but to him it's his passport to a new deal . . . a ticket of admission to the greatest gambling game in the world.

Oil maps are valuable things. They are scientific documents, and the indispensable tool of the oil industry. Each one is unique. There are many kinds. They are geographic, topographic, and stratigraphic. They can be surface geological, subsurface geological, or paleogeological. They may be seismic, magnetic, or gravity. But they are all bound together by one common bond and they tell a single story—the story of oil.

An oil map is a portrait—a mosaic of a century of accomplishment by the oil industry. The first one was prepared in America in the seventeenth century. A French missionary drew it to describe an oil seepage somewhere along the New York-Pennsylvania state line. He labeled it "Fontaine de Bitume." And from that early beginning oil maps have constantly been expanded and improved until today the United States boasts the most complete and detailed coverage in the world.

We open this Special Exploration Section with a comprehensive collection of 16 pool maps of the principal oil and gas areas in our country. Here's a bird's-eye view of U. S. oil achievement. Every red or green spot on these maps probably represents a multitude of other kinds of maps that went into its discovery. These red and green spots are the oil and gas fields of today. The blank spaces are the undiscovered fields of tomorrow.

Oil maps are for men with a mission. They are charts of buried treasure, found and unfound, and the men who have found this treasure are called oil finders. They include the geologists, the geophysicists, the

wildcatters, and even the early-day creekologists and dowsers.

Modern oil maps spring almost entirely from the efforts of the geologist and the geophysicist. One major oil company may well employ more than 2,000 different maps during the course of a normal year's operation.

On the next 16 pages, then, are 16 portraits — portraits painted by a quarter of a million people engaged in the search for oil, using a brush with 1,700,000 bristles. Every bristle was a drilling rig.

. . . The areas the maps cover

MAP NO. 1 (Calfornia). Here are some of the most famous oil maps in history—Signal Hill, Kettleman Hills, Midway, and dozens of others. Californians still are searching, drilling nearly 500 wildcats yearly. Today their search is centered on deeper sands in the older fields and new pools on their flanks. Greatest future potential for California is believed to lie offshore, and the ocean drilling campaign will reach full bloom in the next few years.

MAP NO. 2 is a picture of some of the most active oil country in the United States today—the Intermontane basins of Wyoming, Colorado, and Utah. Rocky Mountain oil finders are busily searching and drilling the many surface structures in that part of the country and ferreting out the myriad stratigraphic traps that lie hidden on their flanks. Construction of the Pacific Northwest gas pipeline in 1955 was the single greatest stimulus to exploration of these basins for new gas fields.

MAP NO. 3 portrays the vast Powder River and Big Horn basins and fields that have been found there. Here's another Rocky Mountain region where much exploration remains to be done before its full potential will be realized. Today new fields are being found in rock formations that had never before yielded oil or gas, especially in the Powder River basin, and a lot of new deep drilling lies in the future for all of northern Wyoming and southern Montana.

MAP NO. 4 shows the famous Williston basin of North Dakota, Saskatchewan, and Montana. First opened to oil production in 1951, this enormous area in its initial 5 years did not live up to the expectations. But in the last year or so important things have happened. The Mississippian stratigraphic reservoirs that have paid off so handsomely in southeastern Saskatchewan have finally been traced into northern North Dakota. To the west, a deep Ordovician campaign is swinging along. Far to the south, a handful of new Pennsylvanian and Mississippian fields in southwestern North Dakota is in the news.

MAP NO. 5. Kansas is one of the oldest and most important of oil states. Here are the famous "shoestring" fields, Nemaha Ridge fields, and the prolific shallow pools on the Central Kansas uplift. Here is El Dorado, Kansas' greatest single field, a 280-million-barrel bonanza. But even with all this history behind it, Kansas still offers lucrative possibilities to the oil detective. Great stretches of prairie country still await the drill, especially in the Salina basin of north central Kansas and in the western counties of the state. With Oklahoma and Texas, Kansas shares the greatest gas field in the world—Hugoton (see Map No. 7).

MAP NO. 6 is a double-header. It pictures two of the new oil provinces of the nation. The older of these is the Denver basin, a three-state oil bowl shared by Nebraska, Colorado, and Wyoming. Here oil lies in stratigraphic traps, almost impossible to isolate by present-day exploration methods. The only reliable tool is the drill.

MAP NO. 6-A is a picture of the decade's newest and most prolific oil province. This is the famous Four Corners. For the past few years drillers have been busily proving up the vast San Juan gas field in northwestern New Mexico and recently have extended their efforts to the southwest in building a Cretaceous oil trend. More recently, in 1956, the Paradox basin of southeastern Utah was opened and within less than 2 years Paradox operators have uncovered nearly half a billion barrels of oil in the Paradox-Pennsylvanian rocks.

MAP NO. 7 spotlights the Oklahoma and Texas panhandles and Southwest Kansas. Dominated by the vast Hugoton-Panhandle oil and gas field, this tristate region is one of the most active in the country today. Recent discoveries in the western Anadarko basin (east of the big gas field) have brought handsome rewards to wildcatters. At the same time, good new pools are being discovered beneath the Hugoton gas blanket in rocks of Mississippian age. And to the west, Colorado is coming into the picture with new Pennsylvanian oil and gas fields. In the Texas Panhandle, two entirely new basins have been brought into production in the past 2 years; these are the Dalhart basin, centering in Dallam County, and the great Palo Duro basin, lying to ths south of Panhandle field.

MAP NO. 8 After half a century of oil history, Oklahoma still surprises the wildcatter with unexpected success. This state is the home of some of the most famous oil fields in history—Cushing, Burbank, Oklahoma City, West Edmond, and hundreds of others. Today the emphasis is on depth as new fields are found in the deeply buried Ordovician in southern Oklahoma at depths in excess of 16,000 ft. Newest part of the state to come into the picture is the northwestern tier of counties including Harper, Woodward, Ellis, Major, and Woods. On the opposite eastern side the McAlester basin is emerging as a prolific source of natural gas fields, and this play extends eastward into Arkansas.

MAP NO. 9. The greatest oil field in the United States sits like a jewel in the East Texas basin. Surrounding it are a multitude of other important oil and gas fields, most of them producing from the Woodbine Cretaceous sand. The East Texas field is a 5-billion-barrel reserve and nothing else like it has ever been found in America. Despite the tremendous success of the industry in East Texas, the province still holds a host of undiscovered oil pools, and drilling activity continues at a rapid rate. On the west side of Map No. 9 are the hundreds of smaller fields blanketing the famous Bend arch of North Central Texas.

MAP NO. 10. A giant of oil is the great Permian basin of West Texas and Southeast New Mexico. First opened in 1925, the basin has grown to a point of dominance in the nation's oil industry, and today produces nearly half the total production of the Southwest. There is no sign of a letup in wildcatting activity for many years to come. Operators are just beginning to tap the deep beds of pre-Permian age, and the future will bring ever deeper exploration, limited only by man's inability to drill to 40,000 ft.

MAP NO. 11. Two words describe the future of the Gulf Coast—"oil unlimited." Here, too, the only limit on oil discovery is the limitation imposed by the capacity of our drilling tools. Here at 22,570 ft. is the deepest oil well in the world, in Plaquemines Parish, Louisiana. Eventually the industry will move out into the gulf to the very edge of the Continental Shelf where the water is 600 ft. deep, and it can be expected to uncover more billions of barrels.

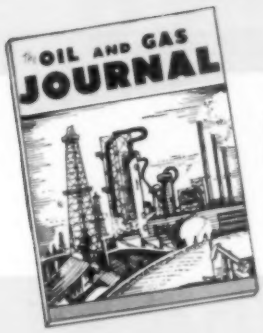
MAP NO. 12. South Texas has richly rewarded efforts of the wildcatter with hundreds of fine oil and gas fields. Today, like many others, the region has its eyes on deep development as its best bet for the future. Many important new fields are being found now at depths of 12,000 and 14,000 ft., and many geologists believe that the tidelands of Texas also will await deeper drilling before they begin to pay off. The present trend in exploration is northwestward along the course of the Rio Grande.

MAP NO. 13. Dixie is in the throes of a deep campaign, too, as Mississippi wildcatters probe to ever greater depths looking for Lower Cretaceous and Jurassic reservoirs. It was not until 1939 that Mississippi came into the national oil picture, but its response to the drill has been most rewarding. Alabama has not been as lucky, but geologists believe that eventually it will be. Its principal oil field to date is Citronelle in Mobile County, a 10,000-ft. Lower Cretaceous reservoir. Both Mississippi and Alabama anticipate offshore drilling campaigns.

MAP NO. 14. North Louisiana and South Arkansas have been important producers of oil for many years. Among the famous oil fields here were Smackover, El Dorado, Caddo, Pine Island, and North Lisbon. The important fracturing process has accelerated exploration in this region for the past 5 years, and the two states now boast many new fields which would never have come into existence without this tool.

MAP NO. 15. The Eastern Interior basin, centered in the tristate area of Illinois, Indiana, and Kentucky, is the happy hunting ground of the independent operator. This region is famous for its well-documented oil history and a unique system of exchange of information, and the result has been discovery. Today the basin is in the grip of a drilling slump, the result of many unfavorable factors, both economic and natural. But it is far from finished as a source of new oil and gas fields, and future exploration must be directed toward the western flank of the basin and toward the deeper-buried Devonian, Silurian, and Ordovician rocks.

MAP NO. 16. The Michigan basin, almost surrounded by the Great Lakes, has been an important source of Paleozoic oil and promises to come up with more of the same. Exploration is not centered in any one corner of the state, but encouragement is being found in all parts of it. The basin is far from adequately drilled and can probably be expected to continue on the active list for many years to come.



U. S. POOL MAPS

PRINCIPAL OIL AND GAS AREAS

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INDEX

1. California
2. Intermontane Basins
3. Northern Wyoming
4. Williston Basin
5. Kansas
6. Julesburg Basin
6a. Four Corners Area
7. Hugoton Area
8. Oklahoma
9. North and East Texas
10. Permian Basin
11. West Gulf Coast
12. South Texas
13. East Gulf Coast
14. Miss.-La.-Ark.
15. Tri-state Area
16. Michigan

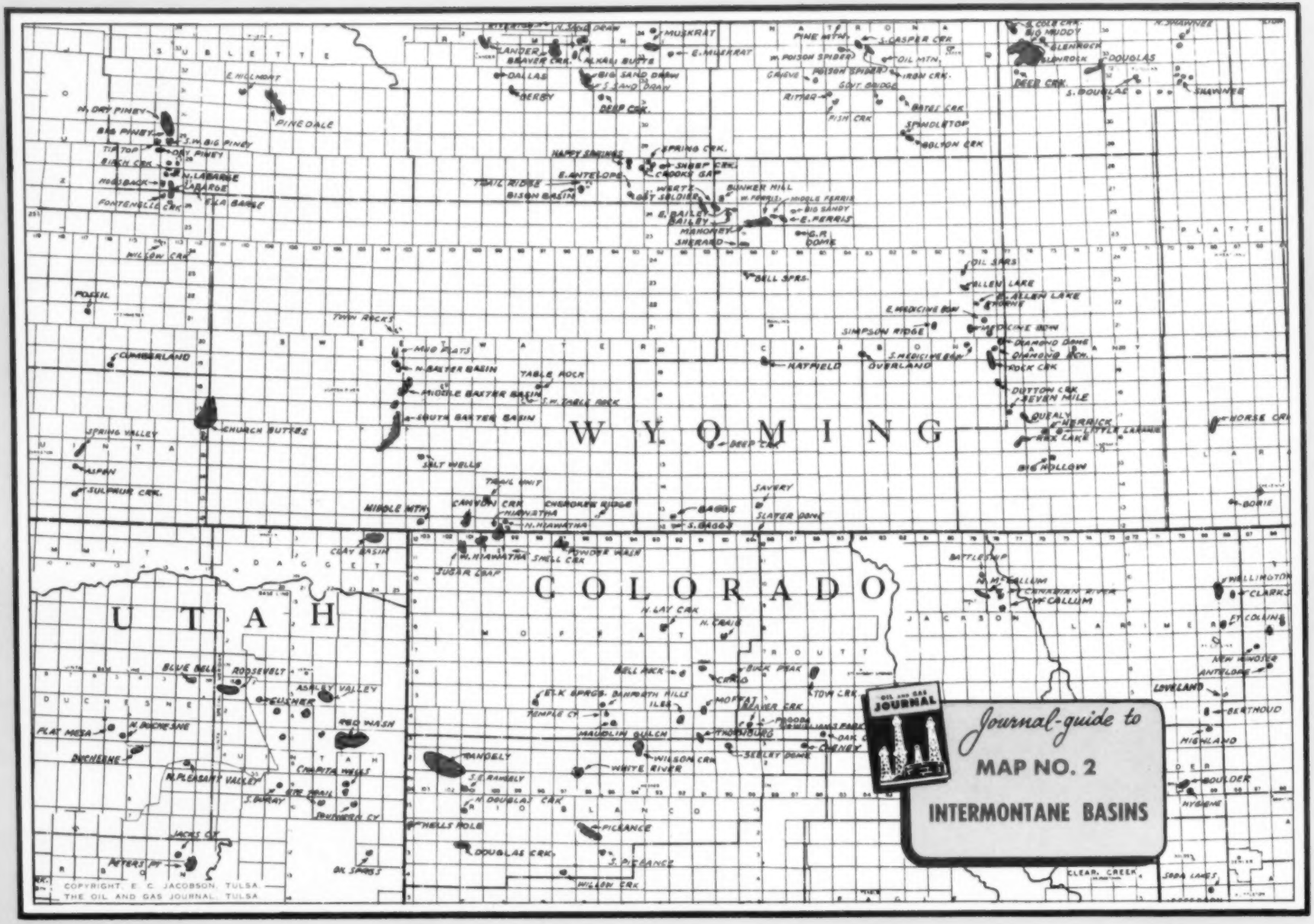
OIL GAS

PACIFIC OCEAN

Journal-guide to

MAP NO. 1

CALIFORNIA


WYOMING
COLORADO
UTAH
Journal-guide to
MAP NO. 2
INTERMONTANE BASINS
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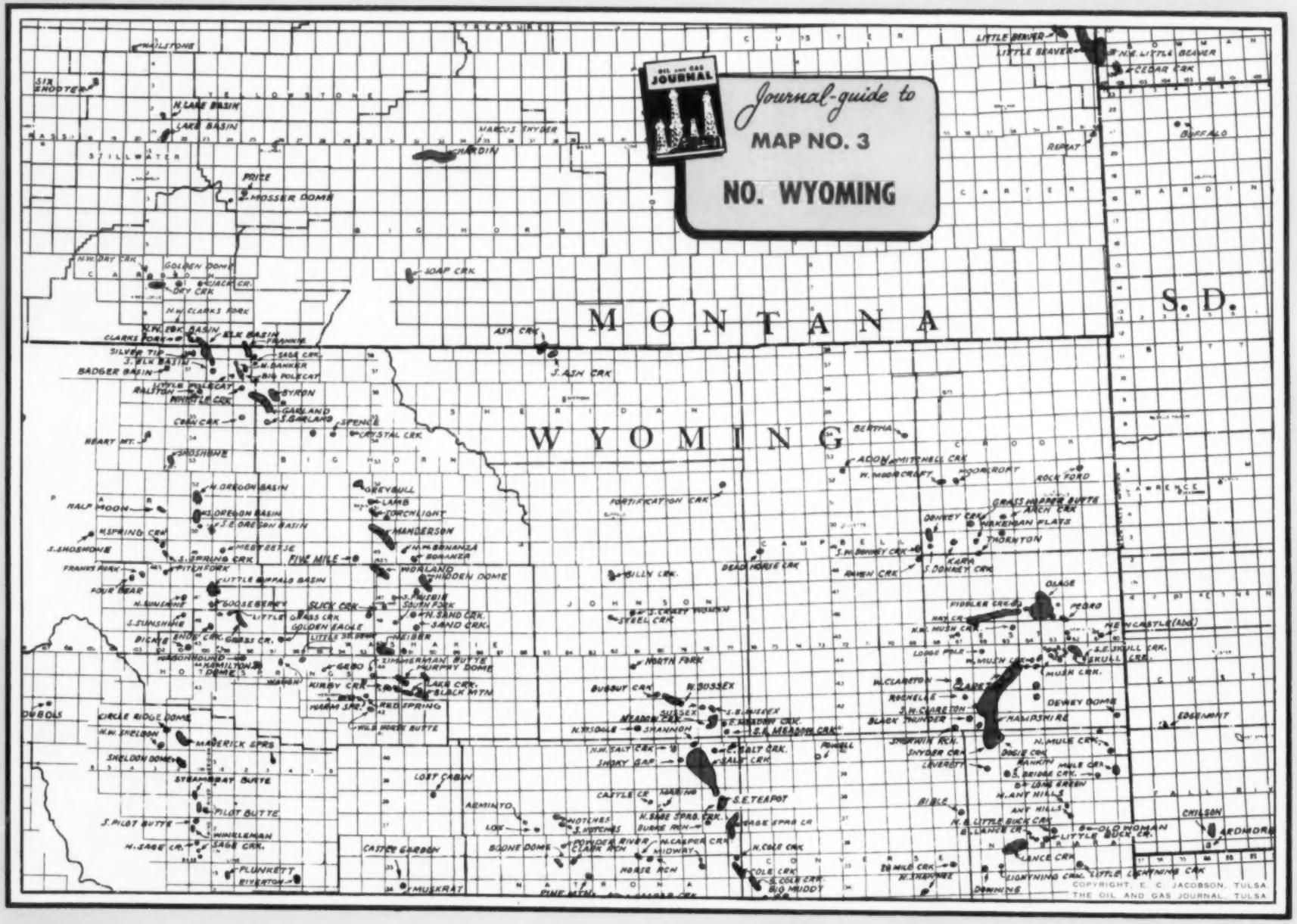
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Journal-guide to
MAP NO. 3
NO. WYOMING
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WYOMING
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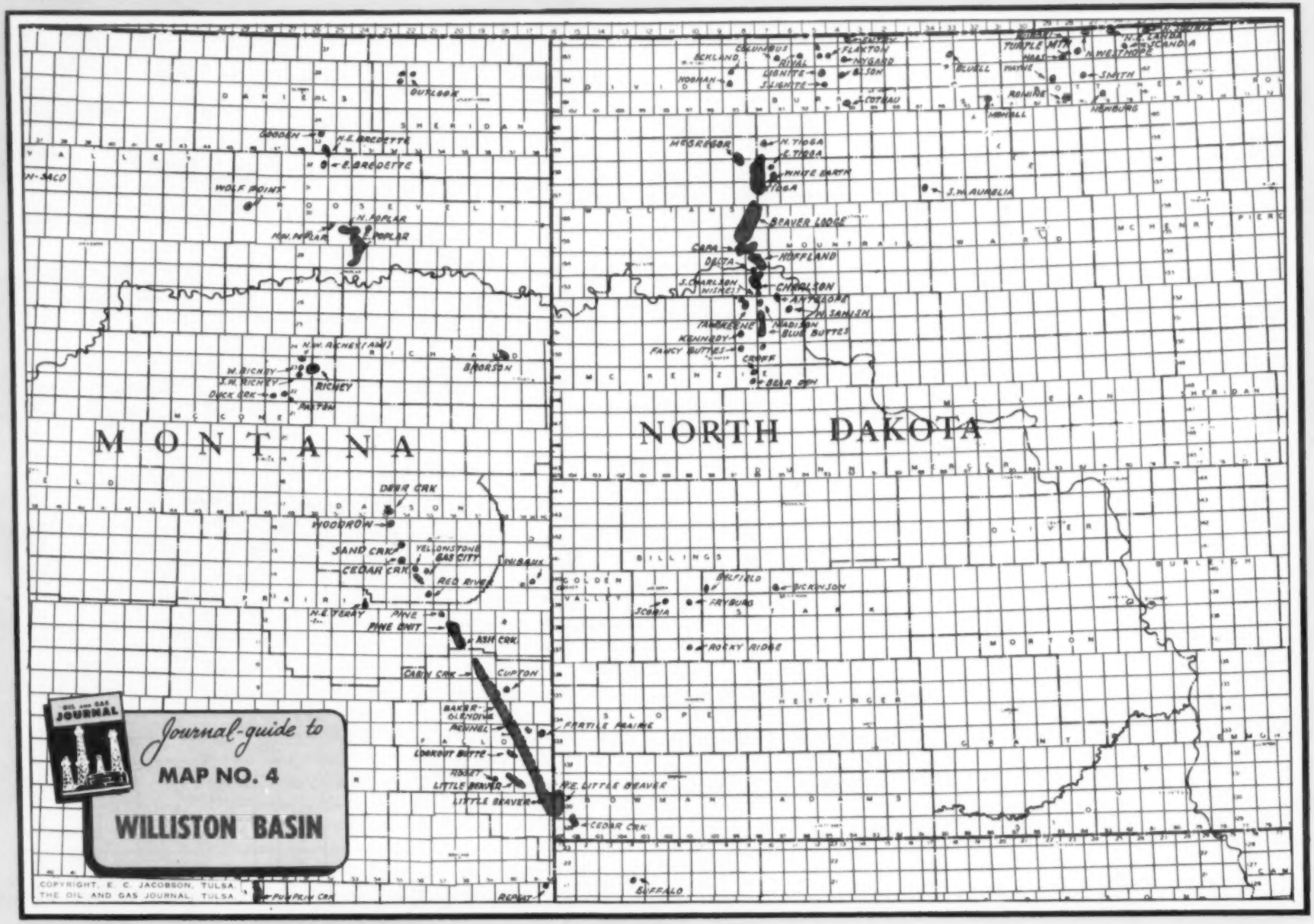
MONTANA
NORTH DAKOTA
Journal-guide to
MAP NO. 4
WILLISTON BASIN
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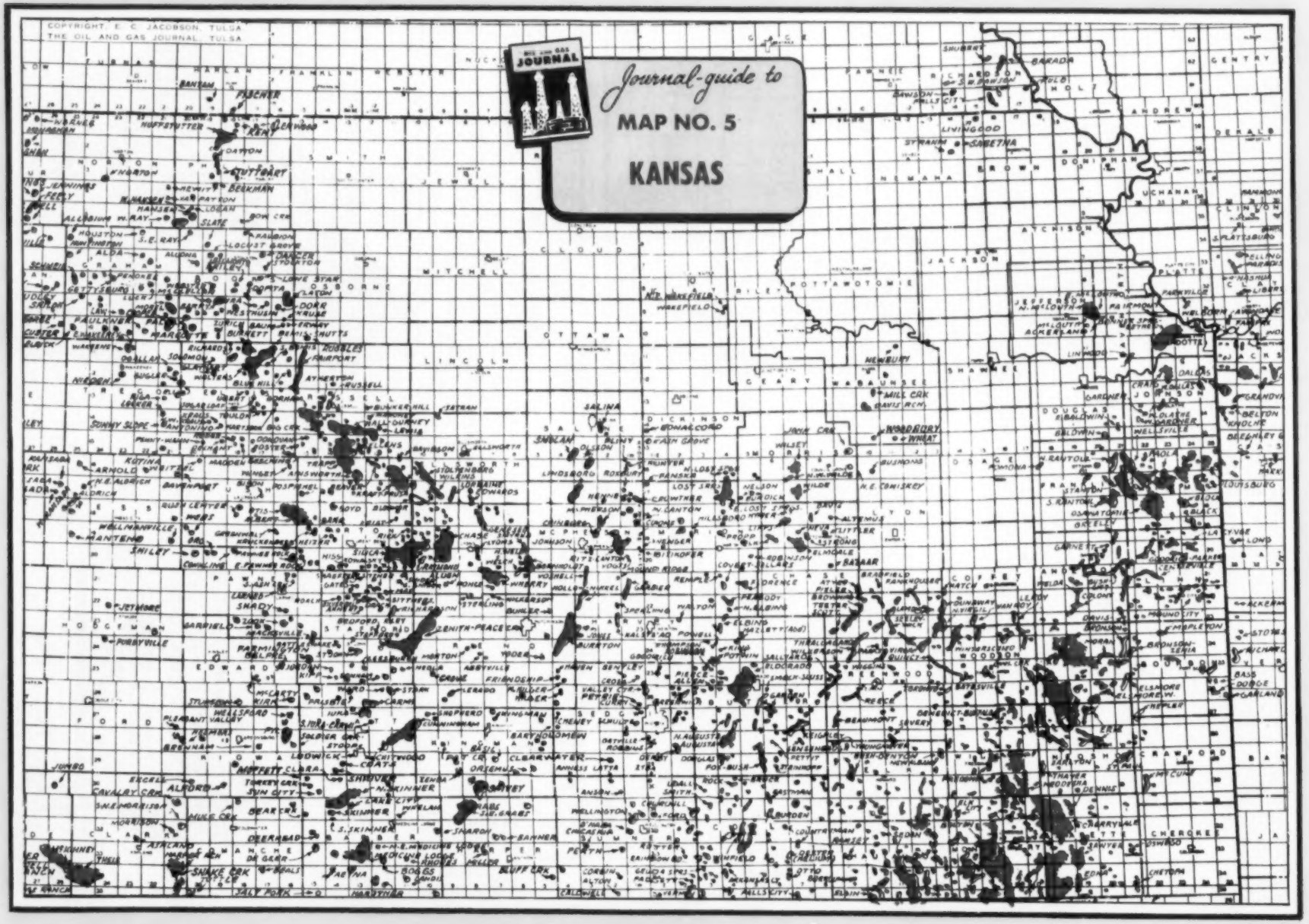
SHERIDAN
VALLEY
ROOSEVELT
McCONE
ELDER
DAWSON
PRAIRIE
RICHLAND
WILLIAMS
DIVIDE
BURKE
MOUNTRAIL
WARD
MCHENRY
PIERCE
OLIVER
BILLINGS
GOLDEN VALLEY
BOWMAN
ADAMS
SLOPE
HETTINGER
GRANT
SIOUX
MORTON
BURLEIGH
OUTLOOK
GLASGOW
N.E. BRocketTE
E. BROCKETTE
WOLF POINT
N. POPLAR
E. POPLAR
N.W. RICHEY (AM)
W. RICHEY
S.W. RICHEY
RICHEY
DUCK CRK
CRANE CRK
DEER CRK
WOODROW
SAND CRK
YELLOWSTONE
GAS CITY
CEDAR CRK
RED RIVER
N.E. TEDAY
PINE
PINE UNIT
ASH CRK
CARY CRK
CLIFTON
BAKER-OIL ENDING
MEDICINE
LOOKOUT BUTTE
RIVETT
LITTLE BEAVER
PUMPKIN CRK
REVERE
ECKLAND
EGELAND
RIVAL LIGNITE
HOBMAN
FLAXTON
NYGAARD
J. LIGNITE
COTEAU
BUHL
TURTLE MTN
MAXE
N.W. LANSFORD
N.W. SCANDIA
N. WESTHOPE
SMITH
ROLLA
NEWBURG
MOHALL
MOGREGOR
N. TIOGA
S. TIOGA
WHITE EARTH
TIOGA
S.W. AUBURN
BEAVER LODGE
CRANE
DAKTA
HOFFLAND
S. CHARLSON
WISNER
CHARLSON
ANTELOPE
S.W. SANISH
TAMARENE
KENNEDY
FANCY BUTTES
MADISON
BLUE BUTTES
CROFF
BEAR DEN
BELFIELD
DICKINSON
SCORIA
FRYBURG
ROCKY RIDGE
LITTLE MISSOURI
N.E. LITTLE BEAVER
CEDAR CRK
BUFFALO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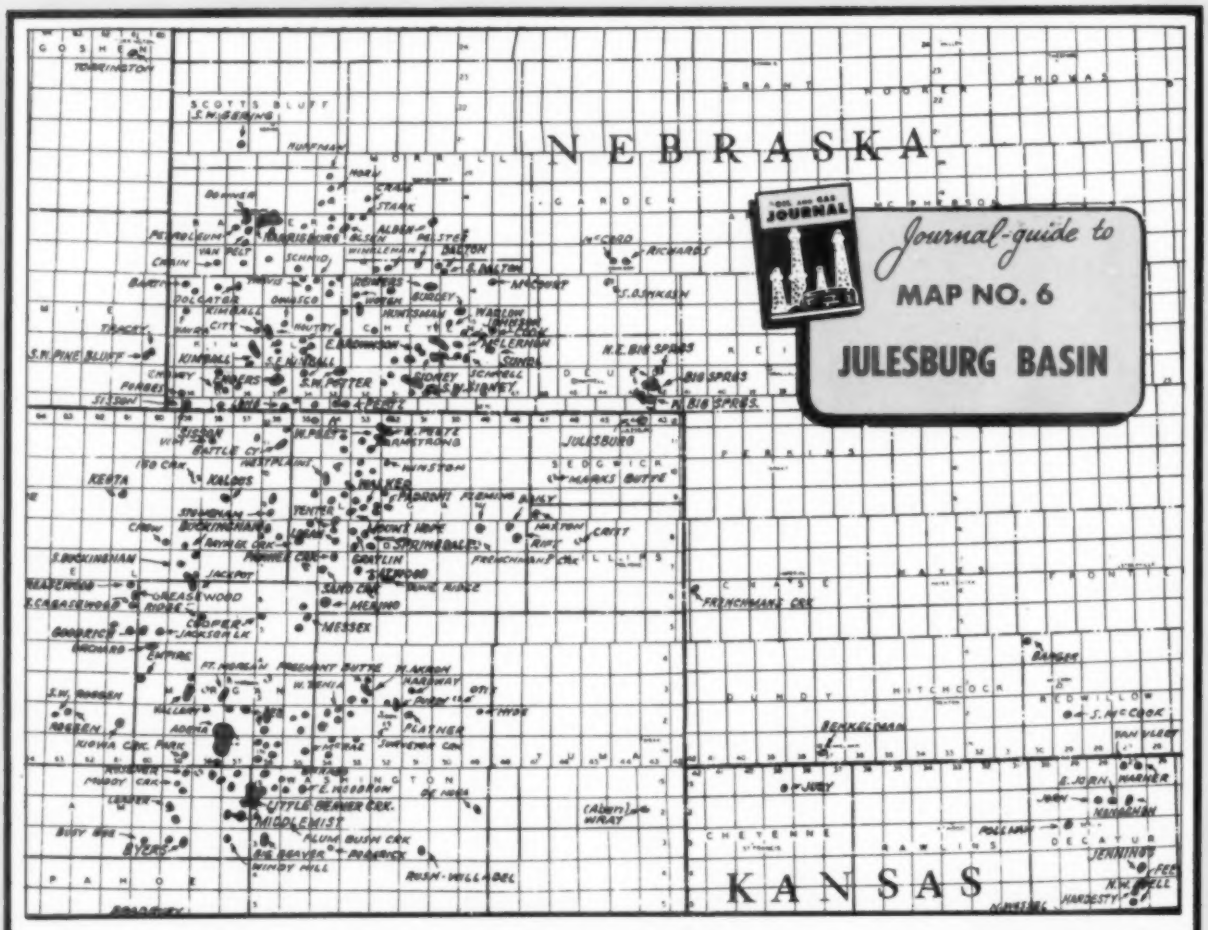
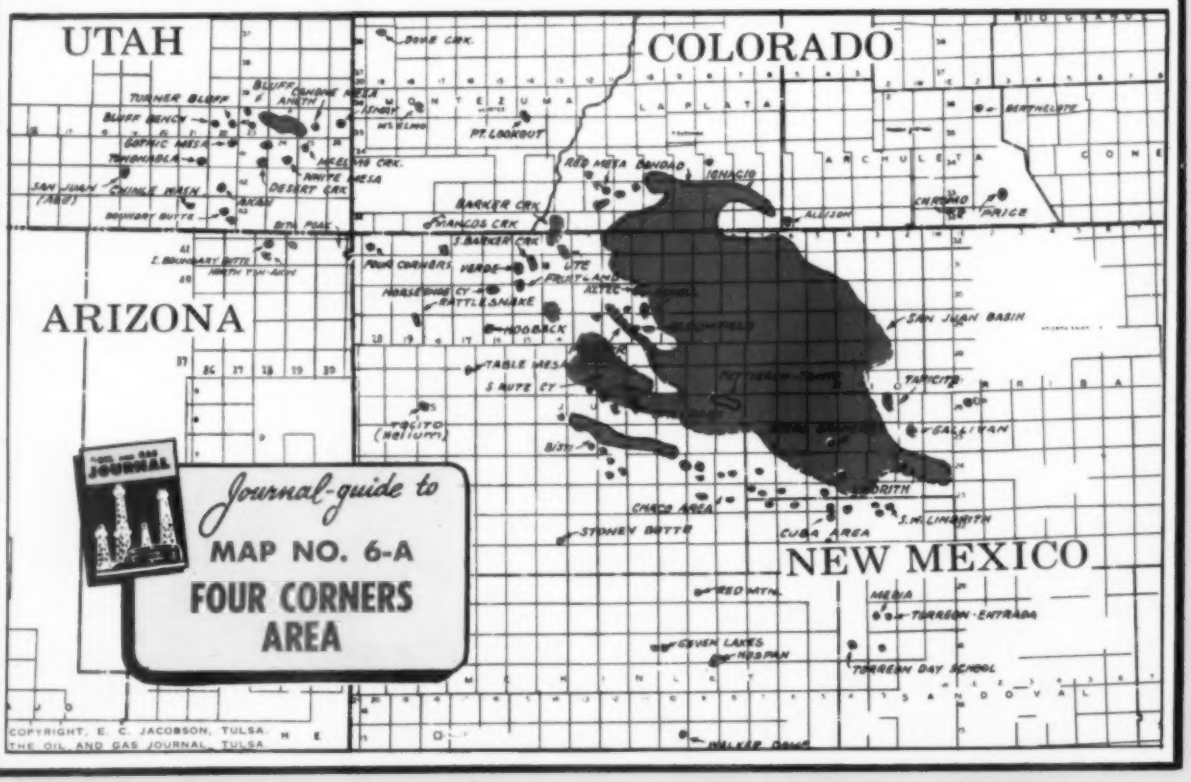
MAP NO. 5
KANSAS


NEBRASKA
KANSAS
Journal-guide to
MAP NO. 6
JULESBURG BASIN
JULESBURG
KEOTA
KALOUS
MESSEX
MIDDLEMIST
BIG SPRGS
N. BIG SPRGS
N.E. BIG SPRGS
FRENCHMANS CRK.
BERKELEY
BERTHOUD
JENNINGS
HARDESTY


UTAH
COLORADO
ARIZONA
NEW MEXICO
Journal-guide to
MAP NO. 6-A
FOUR CORNERS
AREA
SAN JUAN BASIN
TABLE MESA
HOGBACK
FRUITLAND
FLORA VISTA
CHACO AREA
CUBA AREA
STONEY BUTTE
TORREON-ENTRADA
TORREON DAY SCHOOL
RED MTN.
MESA
PT. LOOKOUT
RED MESA
DOLORES
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CONE
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KANSAS
OKLAHOMA
TEXAS
HUGOTON GAS AREA
PANHANDLE
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Journal-guide to
MAP NO. 7
HUGOTON AREA
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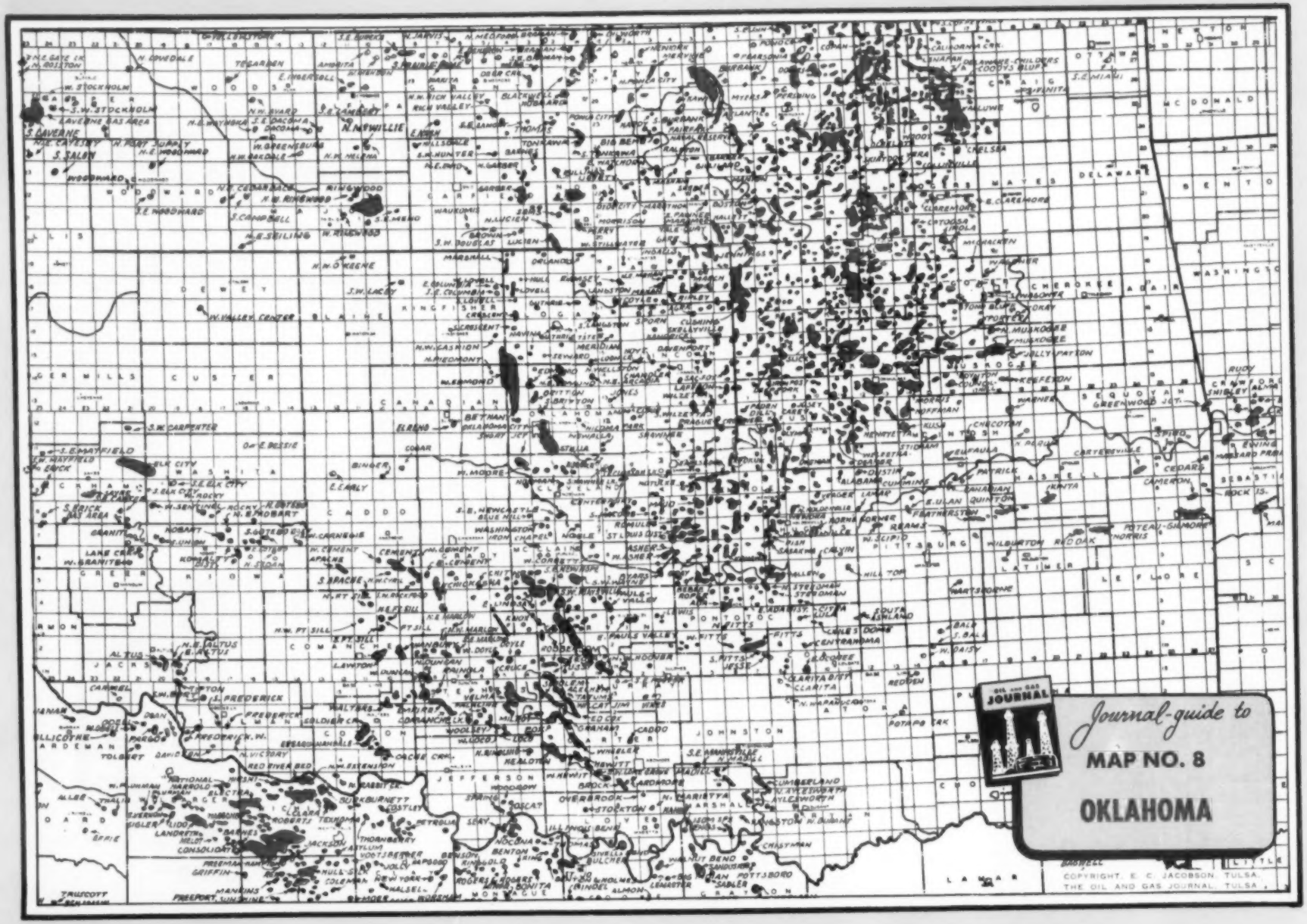

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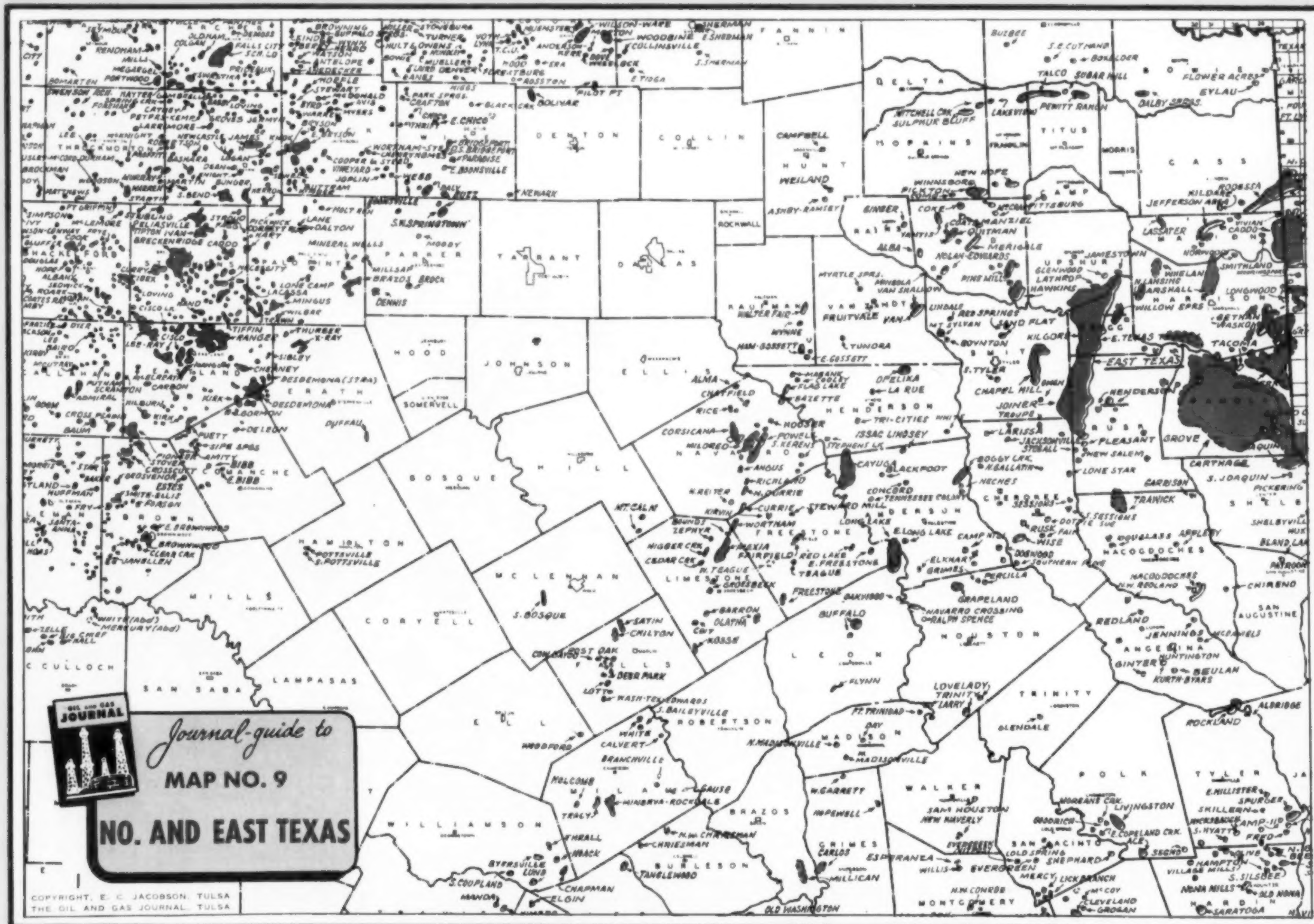

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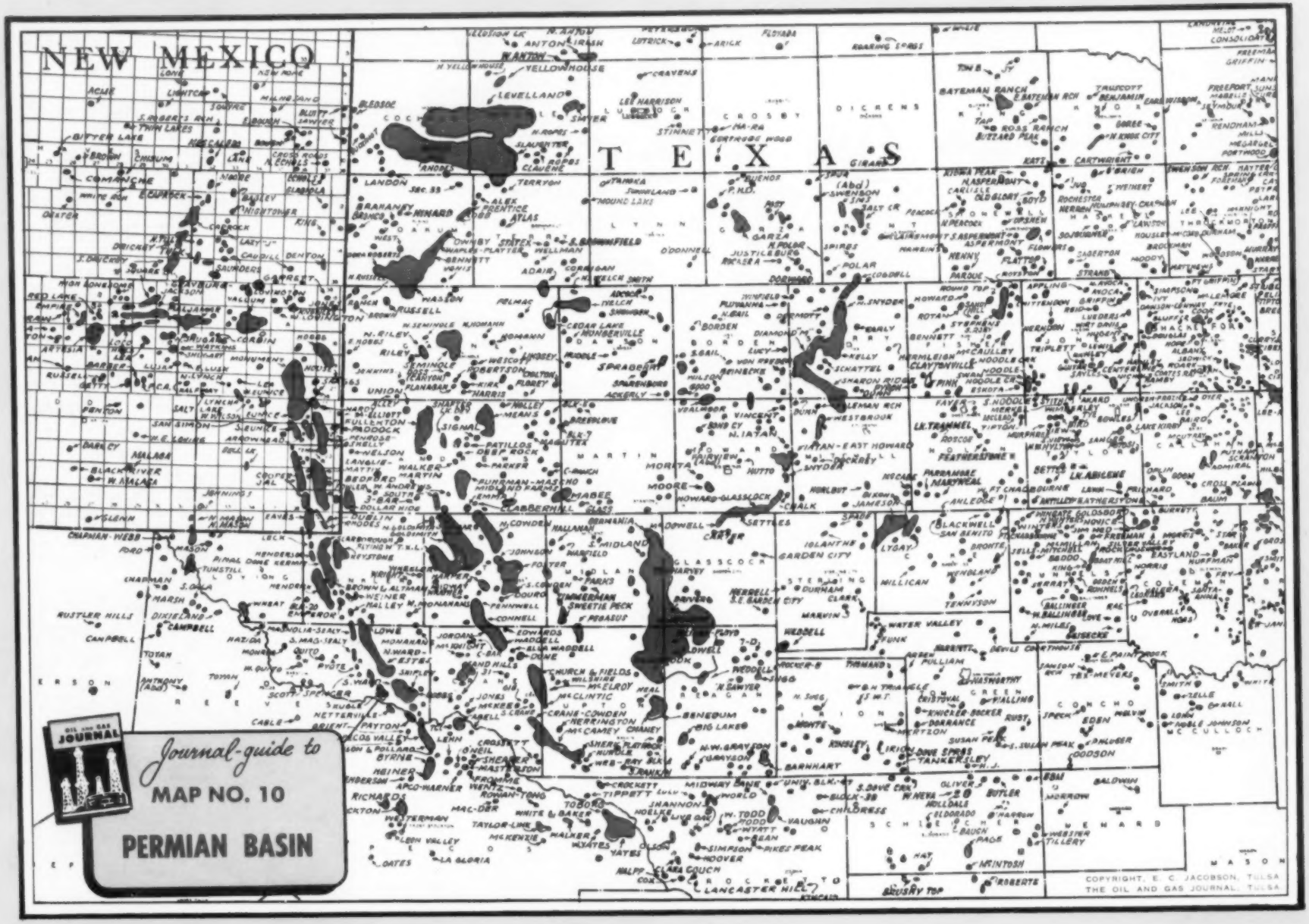
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MAP NO. 10
PERMIAN BASIN
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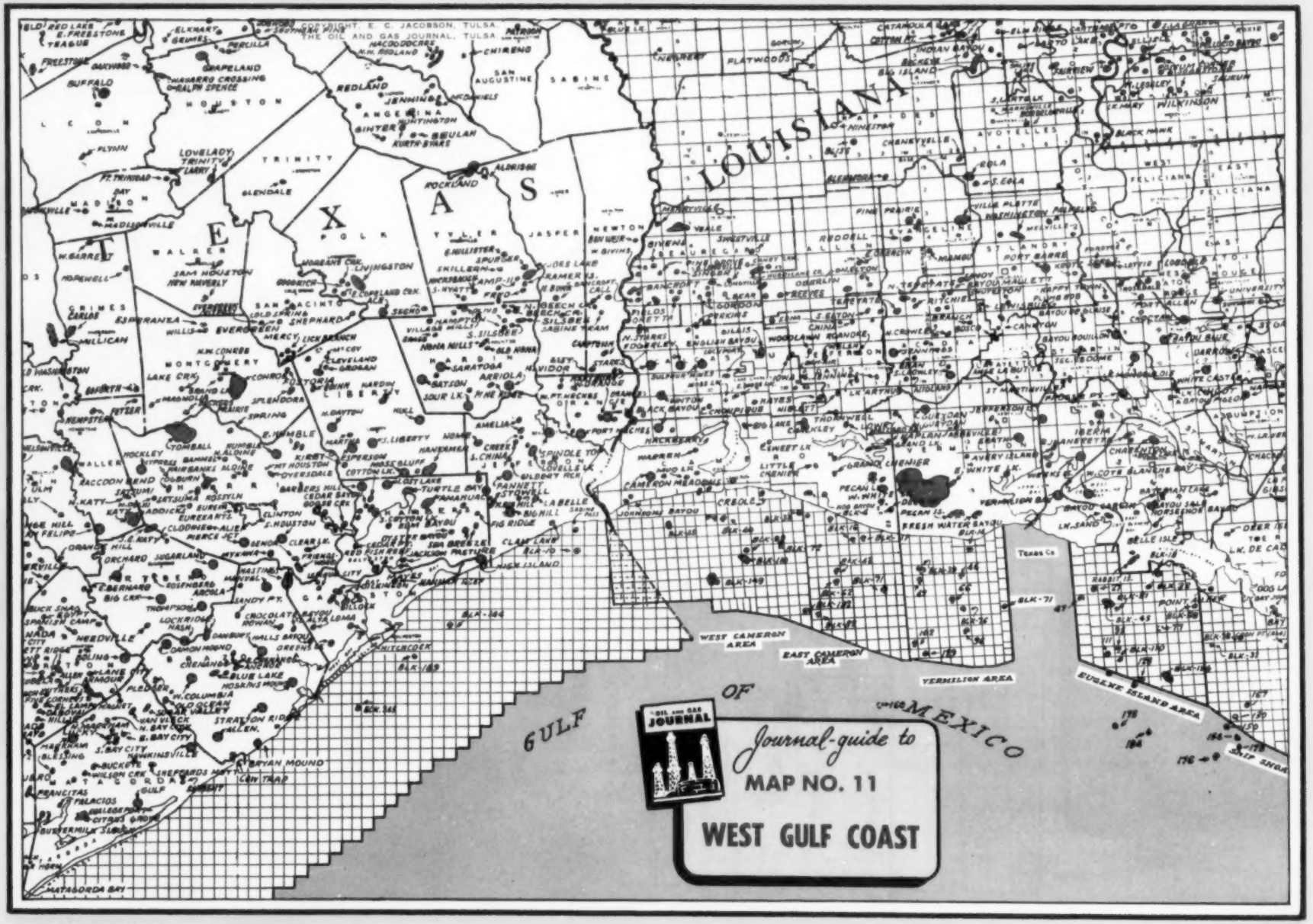
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GULF OF MEXICO
WEST CAMERON AREA
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VERMILION AREA
EUGENE ISLAND AREA
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Journal-guide to
MAP NO. 11
WEST GULF COAST

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MAP NO. 12

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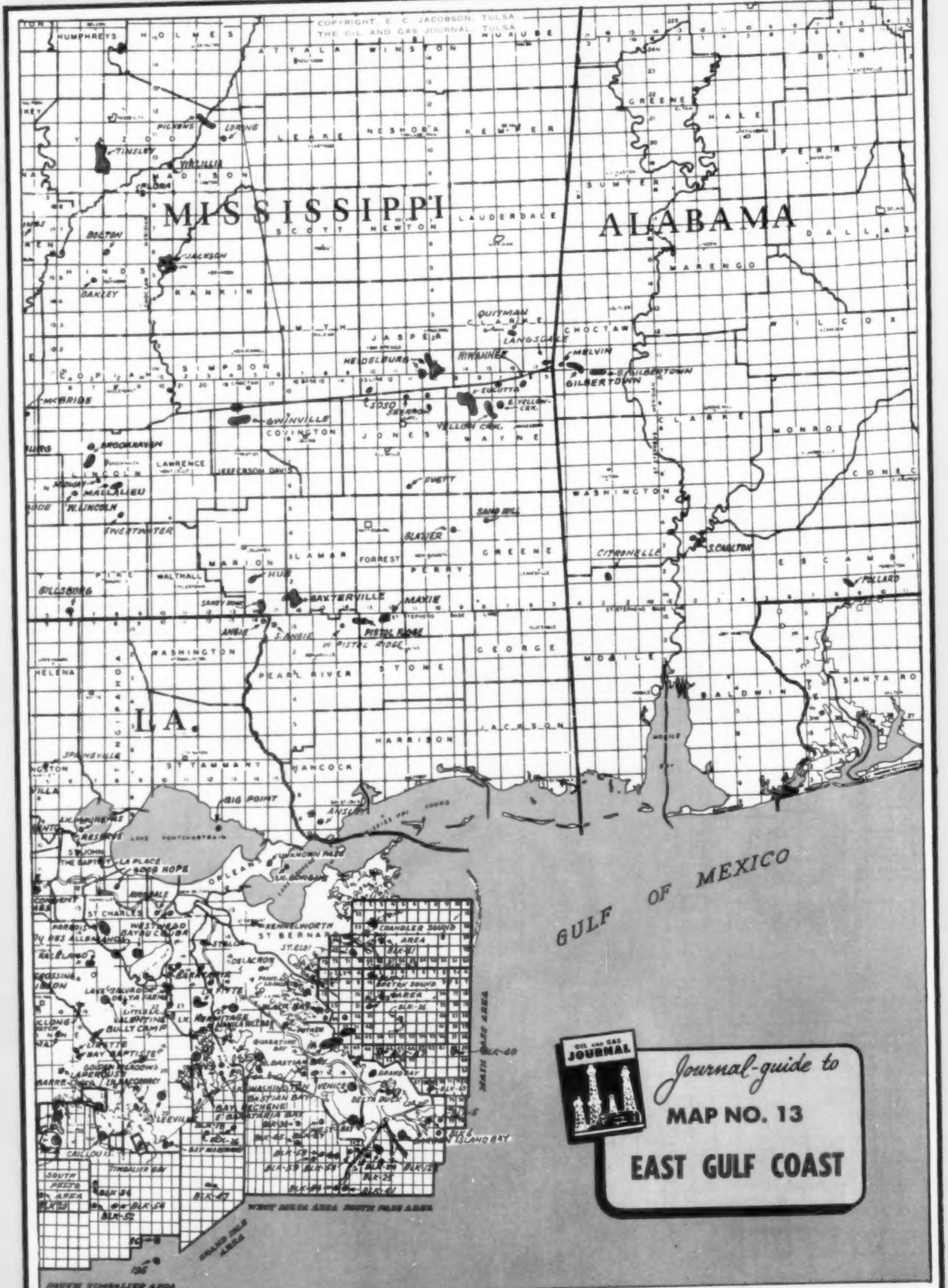
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WINSTON
YAZOO
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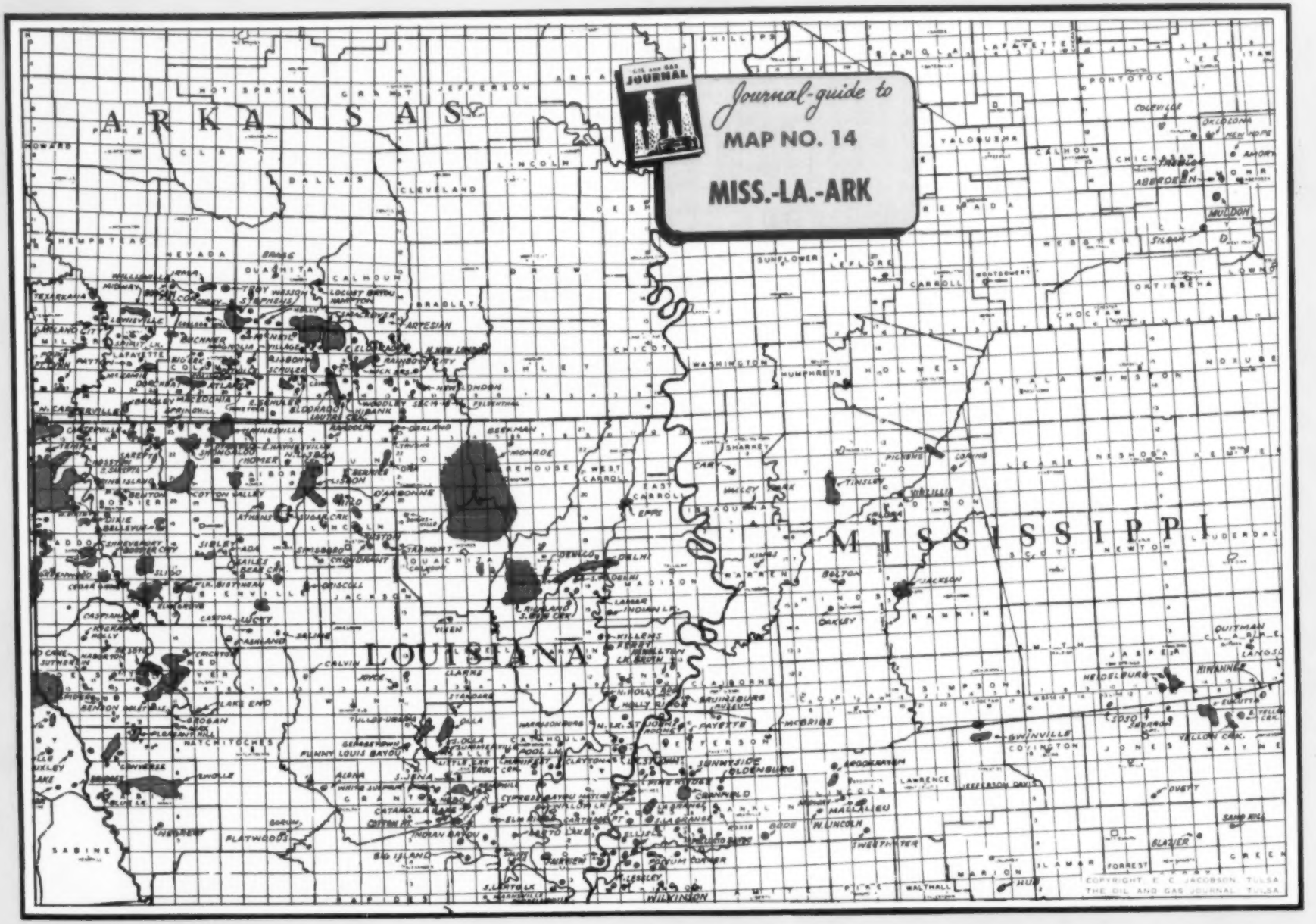
LORING
LEAKE
NESHOBA
KEMPER
TINSLEY
VIRLILIA
MADISON
FLORA
SCOTT
NEWTON
LAUDERDALE
BOLTON
JACKSON
HINDS
OAKLEY
RANKIN
GREENE
HALE
PERRY
SUMTER
DALLAS
MARENGO
QUITMAN
CLARKE
CHOCTAW
LANGSDALE
WILCOX
JASPER
HEIDELBURG
HIWANNEE
MELVIN
GILBERTOWN
E. GILBERTOWN
SIMPSON
COPIAH
EUCUTTA
SOSO
E. YELLOW CRK.
YELLOW CRK.
MCBRIDE
GWINVILLE
COVINGTON
JONES
WAYNE
MONROE
BROOKHAVEN
LAWRENCE
JEFFERSON DAVIS
LINCOLN
MALLALIEU
W. LINCOLN
OVETT
CONEC
WASHINGTON
SWEETWATER
SAND HILL
GLAZIER
MARION
LAMAR
FORREST
GREENE
CITRONELLE
S. CARLTON
PIKE
WALTHALL
HUB
PERRY
ESCAMBI
POLLARD
GILLSBURG
BAXTERVILLE
MAXIE
ANGIE
S. ANGIE
PISTOL RIDGE
W. PISTOL RIDGE
WASHINGTON
GEORGE
HELENA
PEARL RIVER
STONE
MOBILE
BALDWIN
SANTA RO
JACKSON
HARRISON
SPRINGVILLE
ST TAMMANY
HANCOCK
BIG POINT
ANSLEY
RESERVE
LAKE PONTCHARTRAIN
LA PLACE
GOOD HOPE
ORLEANS
UNKNOWN PASS
LK. BORGNE
ST CHARLES
KENNELWORTH
ST BERNARD
CHANDLER SOUND AREA
ST. ELOI
DELACROIX
BRETON SOUND AREA
BARATARIA
LAKE SALVADOR
DELTA FARMS
VALENTINE
BULLY CAMP
LAPEROUSE
LEEVILLE
BAY BAPTISTE
GOLDEN MEADOWS
QUARANTINE BAY
BASTIAN BAY
GRAND BAY
VENICE
DELTA DUCK
BAY MARCHAND
CAILLOU IS.
TIMBALIER BAY
SOUTH PELTO AREA
BLK-40
MAIN PASS AREA
WEST DELTA AREA
SOUTH PASS AREA
GRAND ISLE AREA
SOUTH TIMBALIER AREA
OIL AND GAS JOURNAL
Journal-guide to
MAP NO. 13
EAST GULF COAST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TRISTATE AREA
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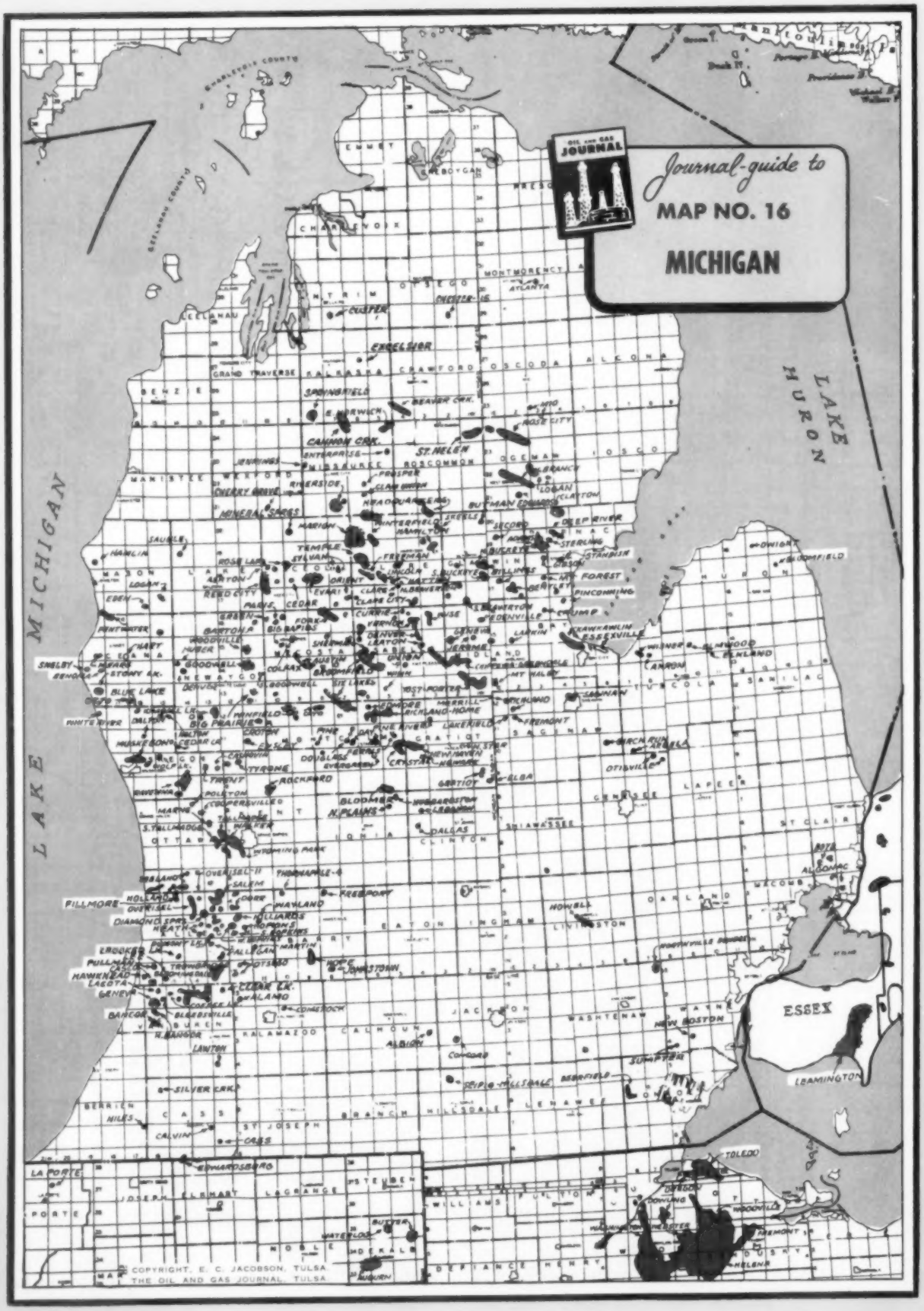
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Journal-guide to
MAP NO. 16
MICHIGAN
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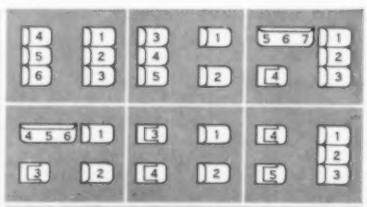

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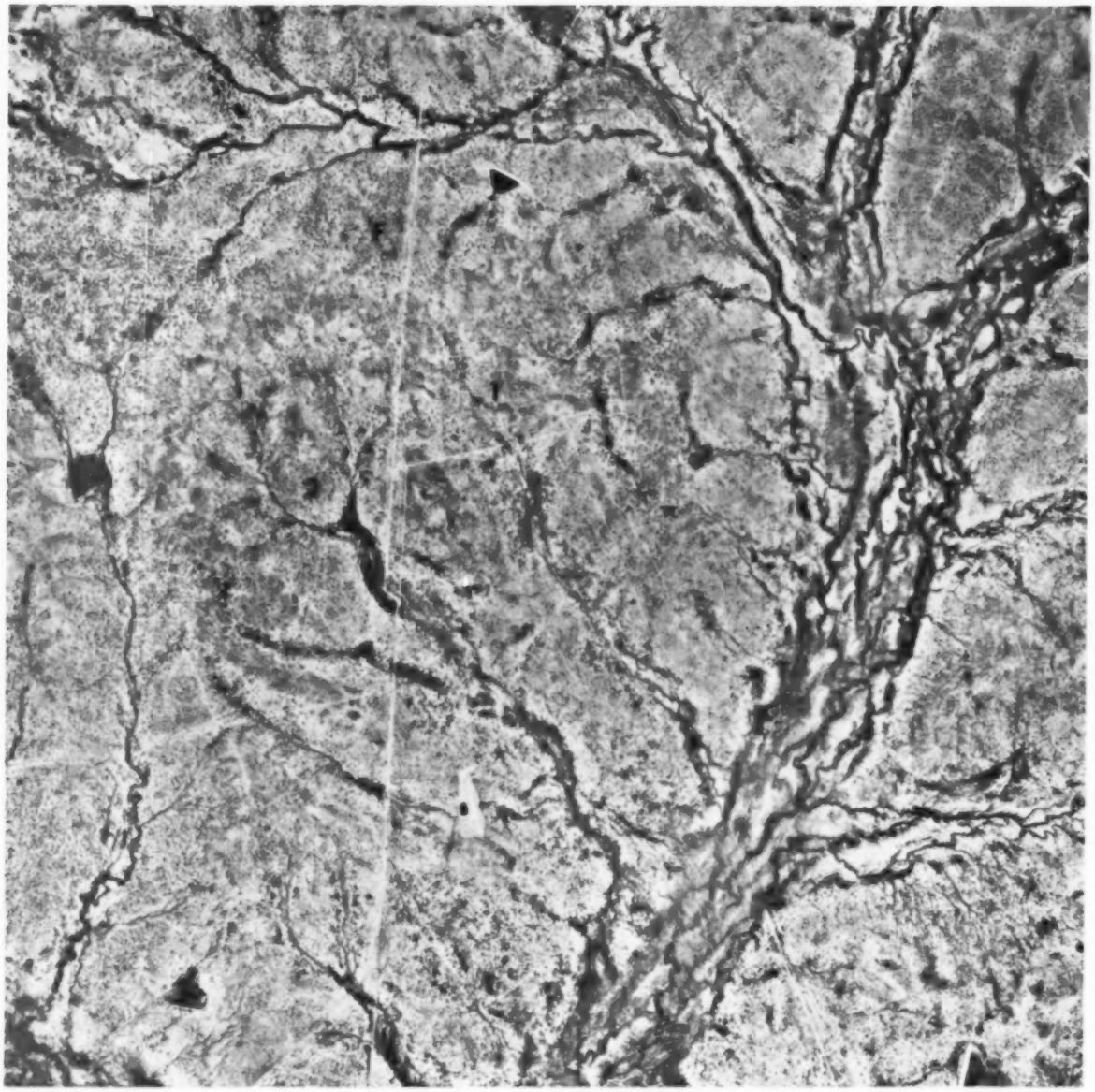


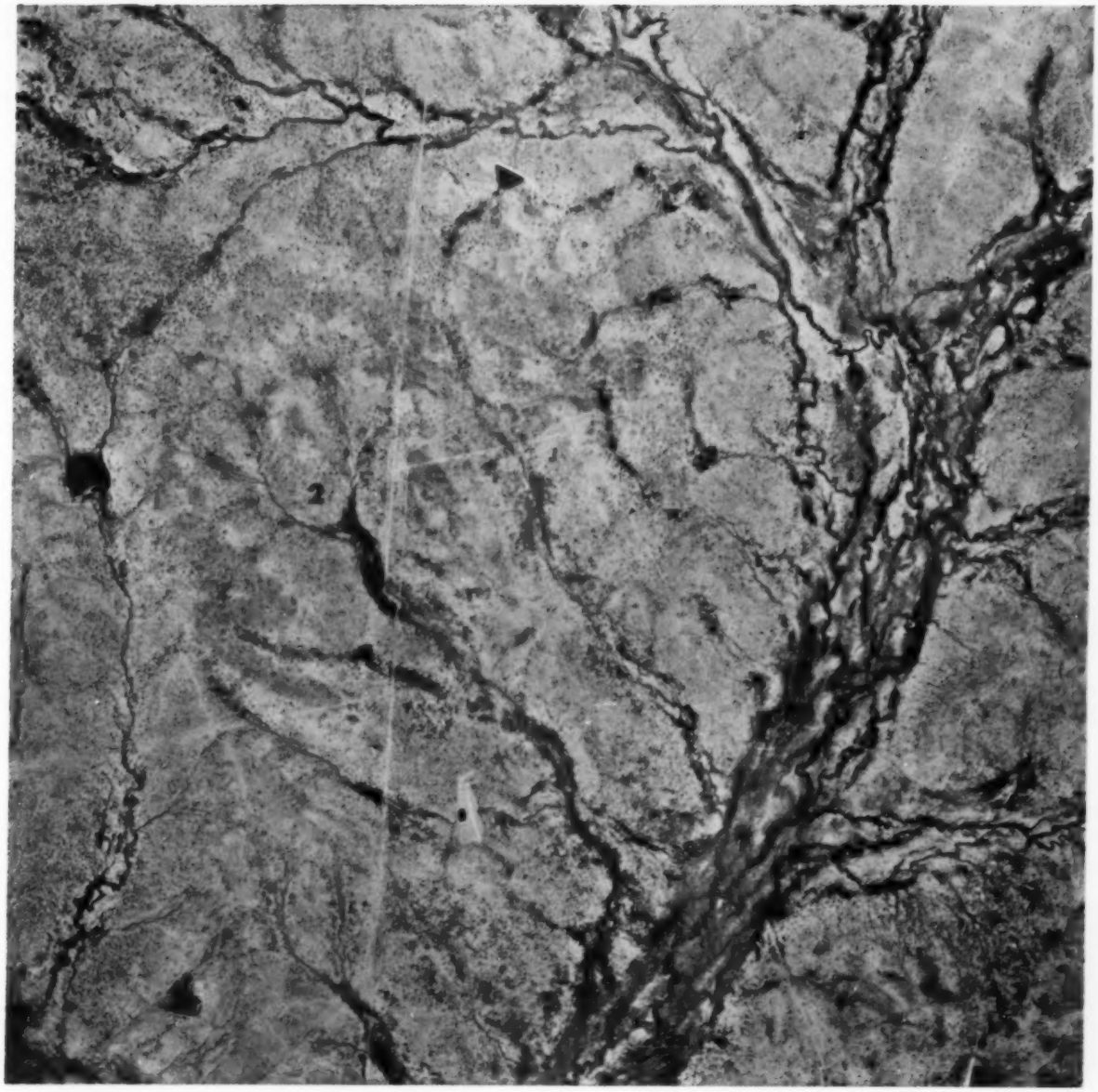
Fig. 1 Black and white revealed the anomaly and fault (F-F) . . . and geologists chose its center to drill—a dry hole (1)

Here's a new oil-finding tool . . .

THE IDEA of aerial photography in color has intrigued geologists for many years. They have felt that if such photography were available it could reveal many subtle changes in color of vegetation, soil, and outcrops. But the numerous technical problems involved have retarded the practical application of color in aerial photography. The lack of uniformity from print to print and the expense of the final mosaics, plus the many photographic problems, has postponed success in the field for many years.

Now, however, a South Texas civil engineer has perfected a process which makes colored aerial photographs available quickly and at a reasonable cost. He is W. W. Baker, of Baker Surveys Corp., San Antonio. Baker was well acquainted with the need for color and was challenged to approach the problem of producing it by divesting himself of techniques previously used in photogrammetry.

A San Antonio independent operator, foreseeing the great possibilities of colored photography from the air, approached Baker and placed a firm order with him. Financially and morally encouraged by this first customer, Baker Surveys Corp. began a series of experiments to encompass the whole process of aerial color. Now, after 2 years of experimentation, the



Reflown in color, surface fault was conspicuous . . . and drilling west of the fault resulted in a producer (2)

Fig. 2

it's aerial COLOR photography

company has come up with a highly developed product.

The reaction of those who have employed aerial photographs in color is most enthusiastic. Some geologists have gone so far as to label it the most advanced and valuable oil-finding tool of the past 20 years. Others say that it is now possible for the geologist to do a great percentage of his field work in the comfort of his office where careful interpretation can reveal surface structures that may be completely overlooked by field work. The mosaics reveal subtle color changes in soil, vegetation, and surface outcrops. Faults become more easily detected. And for more critical inspection after selecting a specific area from the mosaic, stereo pairs in print or transparency form provide even greater clarity and color contrast.

Baker believes that while oil companies will perhaps be the greatest users of aerial photography for exploration, the availability of color in the photographs will spread the use of aerial photography to other industries such as mining, agriculture, forestry, etc.

Two case histories . . . At least two South Texas oil operators claim to have made actual field discoveries via the new avenue of colored aerial

"outcrops may be traced on drafting table . . . in a fraction of the time . . ."

photos. One, a major oil company, used a 300-sq.-mile area of colored mosaic, carefully studied the picture in its office, evaluated the surface structure revealed by it, and with a minimum of field study drilled two wells. Both were good producers. Both were rank wildcats in an area largely overlooked in previous studies by conventional methods. Both wells were drilled solely on the basis of colored aerial photography flown by Baker Surveys.

A San Antonio independent operator used black and white mosaics in the development of several South Texas areas. He had the area reflown in color, after Baker had developed his color process, and claims to have found many new structures that were overlooked or unseen in black and white. The operator flatly states that he reevaluated many areas in color and successfully found new fields on the basis of it.

The advantages . . . Geologists are convinced that color photography offers much more information than black and white. It is true that much information available from aerial prints has gone unexploited in the past. A more practical approach can be employed through the use of color since the color tones of vegetation and soil are much easier to see than the very subtle shades of gray in black and white prints.

Coastal plains, basins, desert areas, shore lines, and other areas with few physical features are more easily studied in color. Large areas previously studied only in black and white can now be reinterpreted with the new concepts and indexes in color. Promising structures can be reflown in any direction of flight to show the greater detail afforded by seasonal changes and shadow changes caused by direction of sunlight.

Geologists' comments . . . The chief geologist of one company has drawn an interesting comparison. He says, "A person's physical condition can be judged by his skin tone. A physician can frequently diagnose a patient's complaint before the patient lists his troubles." He uses this analogy to explain that with regard to the skin or surface of the earth hidden treasures may be revealed or hinted at by colors of surface rocks, soils, and vegetation. This may also apply to the commonly used structural and geomorphic patterns.

Another geologist points to the high percentage of oil and gas fields that produce from structural traps. Many of these of course have been found by surface work. The mapping and interpretation involved is a tedious, expensive process involving ground surveys, field control points, and complicated base maps. As a rule, the outcrops must be walked on the ground before a geologic map can be completed. He contends that with Baker's colored aerial photos, these outcrops may be traced on the drafting table at a fraction of the time and cost involved in older methods.

Color mosaics reveal sharp and clear contacts between strata of different colors; these would probably be unrecognizable in black and white. Areas of vivid soil and vegetative color may be accurately pictured.

How it is done . . . Baker's process begins before the plane leaves the ground. There is a thorough briefing of the pilot and photographer of the area to be flown. Flight lines are established and flight check points to fly accurate, straight lines are determined. Altitude, barometric readings, temperature, etc., are all recorded to help determine correct film filtration and exposure. Economical photographic flying cannot be a hit-or-miss proposition. Extra costs due to reflights have been reduced to a point where there are few reflights.

During flight, the pilot and photographer work in close cooperation to effect operating economies.

Several hours after landing, the color film is developed in electronically controlled processing solutions. Temperatures are maintained to a fractional tolerance to prevent changes in color of the final transparencies. In less than 6 hours after the airplane touches ground, the transparencies may be used for geological purposes. Printing to duplicate transparencies or color prints may then be identified to produce the final finished prints of any given area.

After the mosaics are laid dry, trimmed, tone matched, and correctly placed, a direct copy to a large sheet of print material is made. Baker produces original film in a few hours, prints in several days, and mosaics in a week or so.

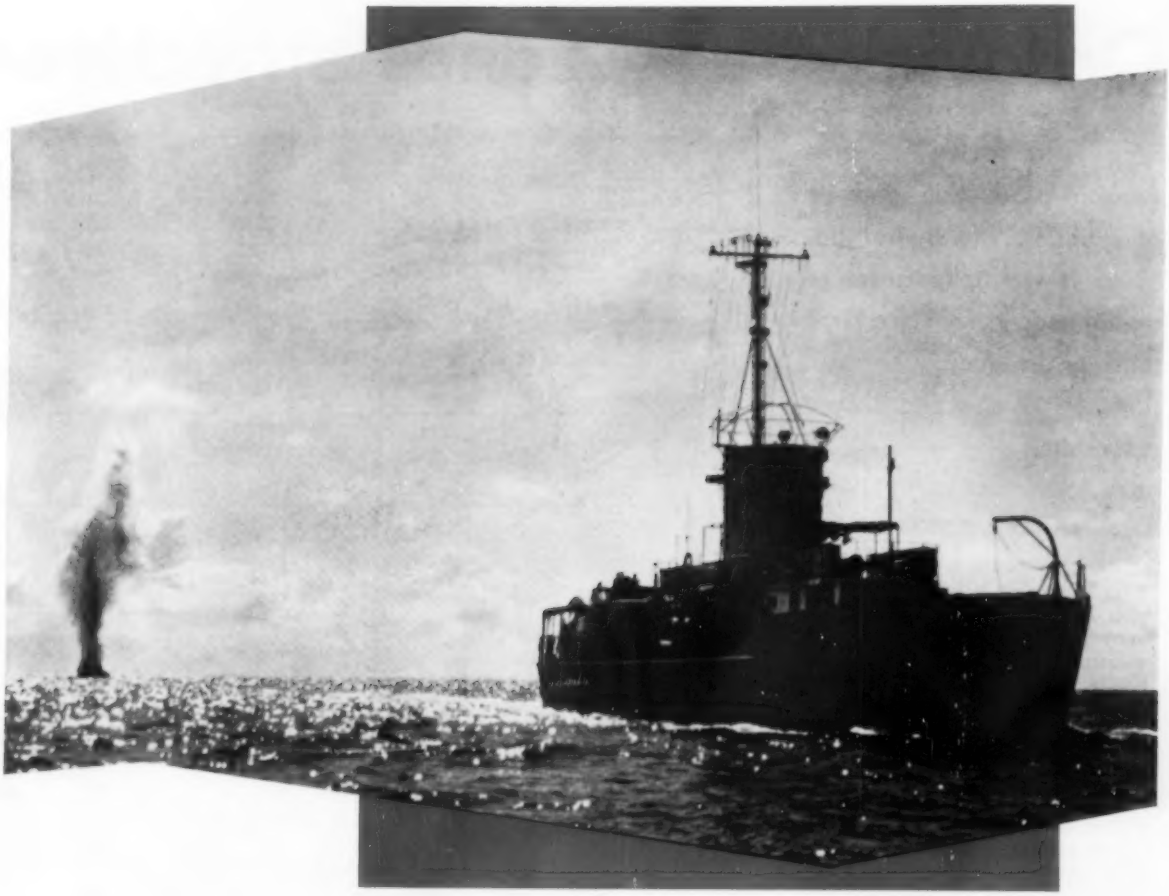
New areas for exploration can be studied in a matter of days after initial interest in the area is generated. Some of Baker's clients have reportedly bought leases and located drilling rigs on the strength of the photography without waiting for complementary field surface geology. The cost of aerial color is declared by the first users to be negligible as compared to the cost of seismograph work, magnetic work, gravity work, or field surface geology of any comparable area; and it is considered by most to be just as useful. The most conservative reactions have been that color is another useful tool that will increase the value of the other methods.

Baker aerial color is usually flown at altitudes up to 20,000 ft. to produce a base scale of 1/24,000, or 1 in. to 2,000 ft. If desired, blowups to practically any scale can be made of specific areas for detailed study. But the 1/24,000 scale has been found to be the most useful for regional study.

Equipment . . . Baker has found it necessary to hand-make most of its technical production equipment such as temperature - controlled developing solution vessels, print material processing racks, and developing tanks of corrosion - resistant plastic. Several firms have worked with Baker to produce the material, supplies, and other equipment necessary for color work. Every available color printing material was tried before final selection of Ansco Printon. Printon and the cooperation of the Ansco staff have greatly contributed to the development of Baker's aerial color. During experimentation it was determined that hand printing of color materials was impossible. So an automatic printer, manufactured by Logetronics, Inc., of Alexandria, Va., was purchased. After many changes it proved to be the solution to the problem of tone and color matching. The prints from which Figs. 1 and 2 were made are Logetronic prints.

An operational airplane for flying altitudes varying from low level to 30,000 ft. was needed. Baker finally chose the 1958 F-50 Supercharged Twin Bonanza by Beechcraft of Wichita, Kans.

What it costs . . . Baker Survey Corp. wanted to lower the cost of color aerial photography to bring it within the means of all independent operators. With the promised improvement of Ansco Printon, improvements in the Logetronic printer, and better flying techniques, cost reductions are inevitable, according to Baker. Increased production through enlargement of plant and equipment may be expected to lower costs still further. At present, the company can produce a colored survey of a large area for about 3 cents per acre.



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Ordovician pay zones attractive

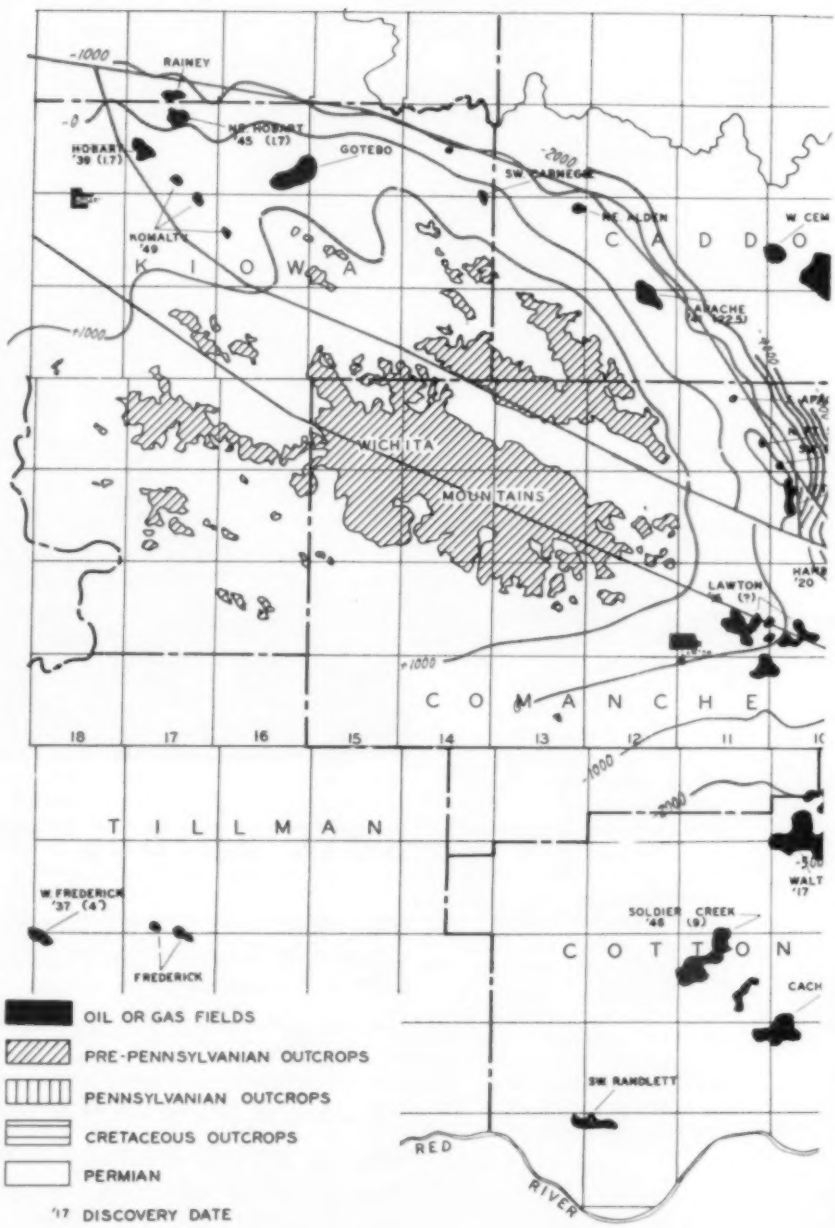
Here is a review of pre-Atokan production and its possibilities. The author believes it will take a lot of disciplined, imaginative thinking and new interpretations to find new and deeper reservoirs.

By FRED P. SCHWEERS

A REGION which currently accounts for 1 out of every 27 bbl. of oil produced in the United States merits repeated analysis and review. This is particularly true if the region is a relatively small portion of the fourth-ranking oil-producing state.

Trending through the heart of this region, southern Oklahoma, are the Wichita Mountains—Criner Hills axis and its associated flanking anticlines. These structures were abundantly productive from the Middle and Upper Pennsylvanian formations in years past. However, exploration during the last 10 years has emphasized the importance of the pre-Atokan strata. Formations in the Lower Pennsylvanian and pre-Pennsylvanian now account for nearly one-half of the area's present daily production.

In the matter of future reserves, the older and deeper reservoirs outweigh the younger preponderantly. The sandstones of the Springer series account for most of the pre-Atokan production; however, recent deeper drilling has proved successfully the great potential of the Ordovician, notably at the Knox (3n-5w) and Enville (7s-3e) fields.



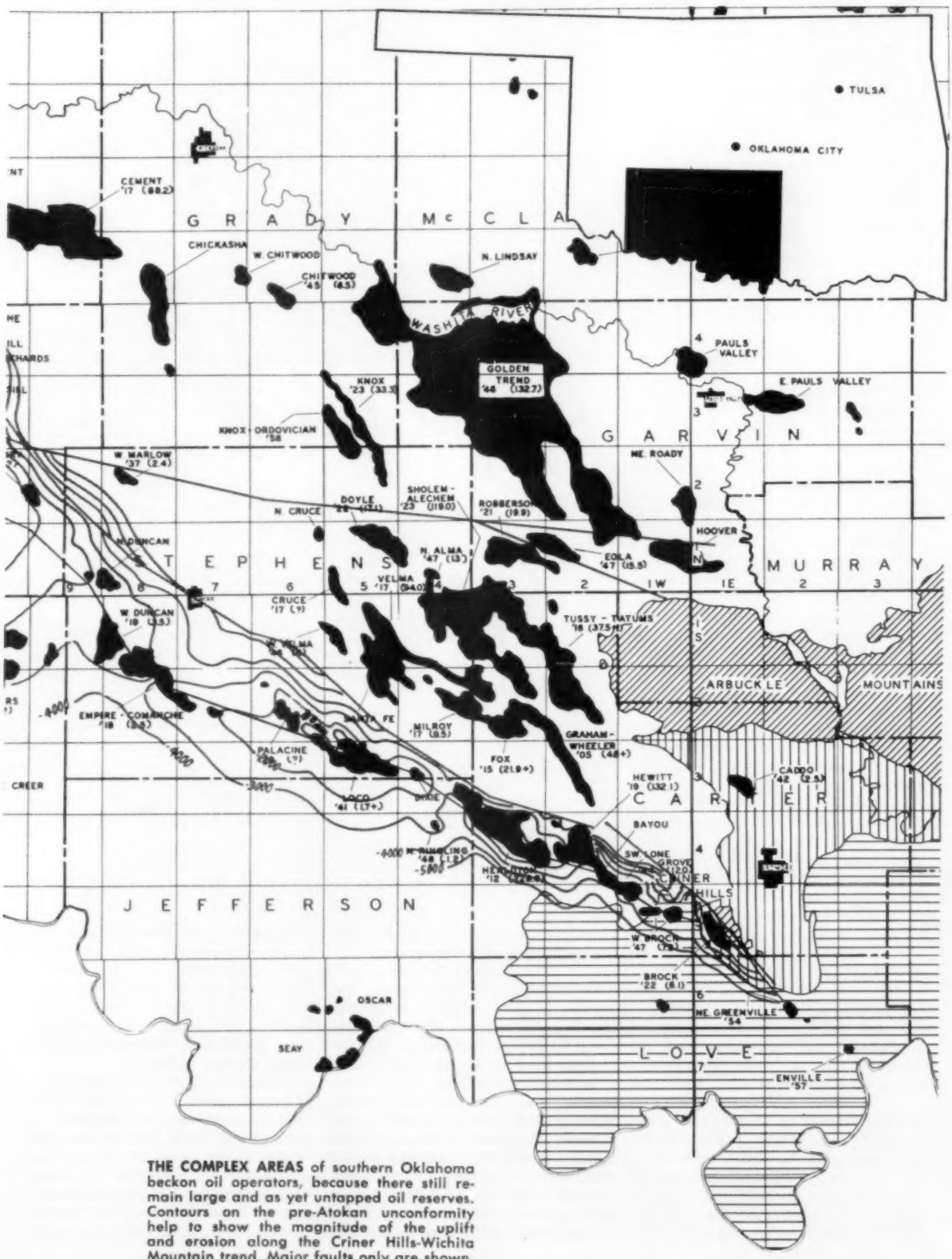
Geology

The Permian red beds overlie nearly nine-tenths of the area under consideration. In the southeast section, the Pennsylvanian system is exposed in the Ardmore basin in Carter County. This basin is bordered on the north by the Arbuckle Mountains, where nearly the entire pre-Pennsylvanian sequence is exposed. To the south, in Love County, are outcrops of Cretaceous, mainly of the Trinity series.

Less than 5 miles southwest of the town of Ardmore lie the Criner Hills. On these gently rolling hills of less than 4 miles area, almost the entire Ordovician-to-Mississippian sequence outcrops. Although slight in surface elevation these pre-Pennsylvanian outcrops tower 15,000 ft. structurally higher than their subsurface counterparts in the Ardmore basin foredeep 10 miles east. To the west and northwest the Criner Hills plunge rather gently under the Permian, but the trend persists as a prominent geological anticlinorium striking approximately N. 65° W.

Exposures of Arbuckle dolomite

lure in southern Oklahoma



THE COMPLEX AREAS of southern Oklahoma beckon oil operators, because there still remain large and as yet untapped oil reserves. Contours on the pre-Atokan unconformity help to show the magnitude of the uplift and erosion along the Criner Hills-Wichita Mountain trend. Major faults only are shown. Fig. 1.

THE AUTHOR

Fred P. Schweers is exploration manager for Mercury Drilling Co., Tulsa. He received his M.A. degree in geology from Indiana University in 1940. Since then, he has worked as a geologist in Oklahoma, primarily in southern Oklahoma. Published articles include: "Southwest Lone Grove Field," AAPG. "Geology of Southern Oklahoma," Vol. 1 (J. M. Westheimer and F. P. Schweers); "The Milroy Field of Carter and Stephens County, Oklahoma," AAPG Geology of Southern Oklahoma, Vol. 2; "Southern Oklahoma—A Complex Geologic Puzzle," World Oil, May 1957.

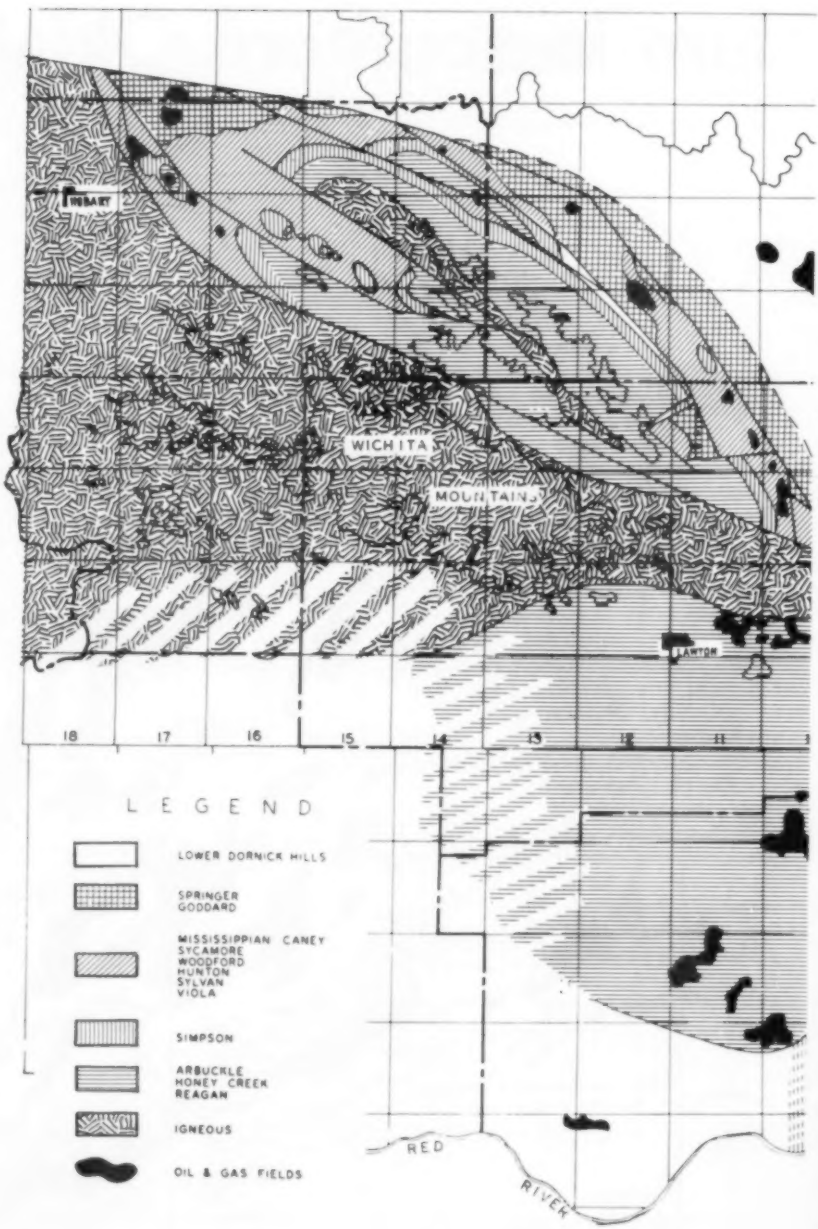
and Precambrian igneous rocks emerge from beneath the red beds in 2n-12w, Comanche County. This eastern extremity of the Wichita Mountains lies about 80 miles northwest of the Criner Hills. The westward extremity of the Wichita Mountains, 6n-21w, in Greer County, plunges beneath the Permian, but extends in the subsurface into the Texas Panhandle where it is called the "Buried Amarillo Mountains."

Except for small outcrops of Viola and Simpson in 6n-15 and 16w, Kiowa County, only the Arbuckle, Honey Creek, and Reagan strata and the Precambrian igneous rocks are exposed in the Wichita Mountain area. A granite peak, Mount Scott (3n-13w), reaches an elevation of 2,840 ft. above sea level, which is over 1,400 ft. above its base.

Geologically, the surface elevation of Mount Scott is comparatively minor when one considers that 35 miles to the north a wildcat in 11-8n-12w, was drilled to 17,823 ft. but did not penetrate below the Springer series. This dry hole is located on a subsurface anticline. Howell & Howell, and Ellison, et al are currently drilling a 24,000-ft. Ordovician test in 4-9n-12w, about 7 miles northwest.

Structural upheaval of this magnitude was not wrought in one epoch of geologic time. Two major and, at least, two minor epochs of diastrophism were required.

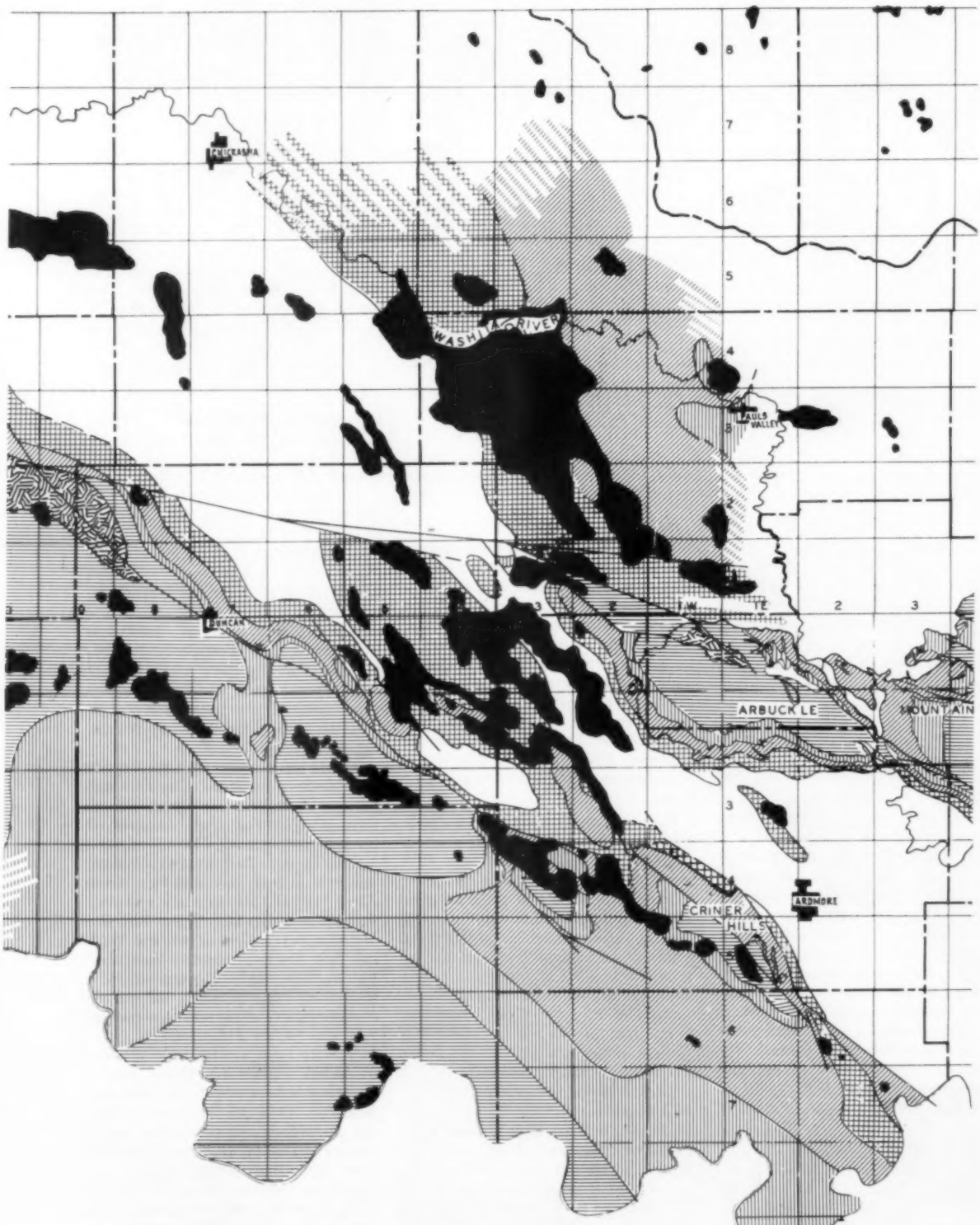
Wichita orogeny . . . During late Mississippian and early Pennsylvanian time over 6,000 ft. of sediments were laid down in a long belt across southern Oklahoma, between the positive areas to the north and the Nocona arch to the south. Although the



Chester series was limited to the western portion, the Springeran and Morrowan strata covered the whole pre-Atokan basin. At this point, the Wichita orogeny occurred, in Middle Dornick Hills time. The Wichita-Criner Hills axis was created and the Nocona arch further uplifted.

Erosion removed the entire sedimentary sequence from the present Wichita Mountains as proved by the presence of arkosic sandstones in the Upper Dornick Hills (Atokan). Simultaneously, the Loco and Healdton anticlines were formed and the Criner Hills uplifted. Erosion cut as deeply as Arbuckle, as evidenced by the abundance of limestone conglomerates in the adjacent upper Dornick Hills sediments. North of the Wichita-Criner axis, the Graham-Milroy trend was eroded to the Hunton, and the North Alma - Sholem - Alechem anticline lost its lower Dornick Hills and upper Stringer sediments.

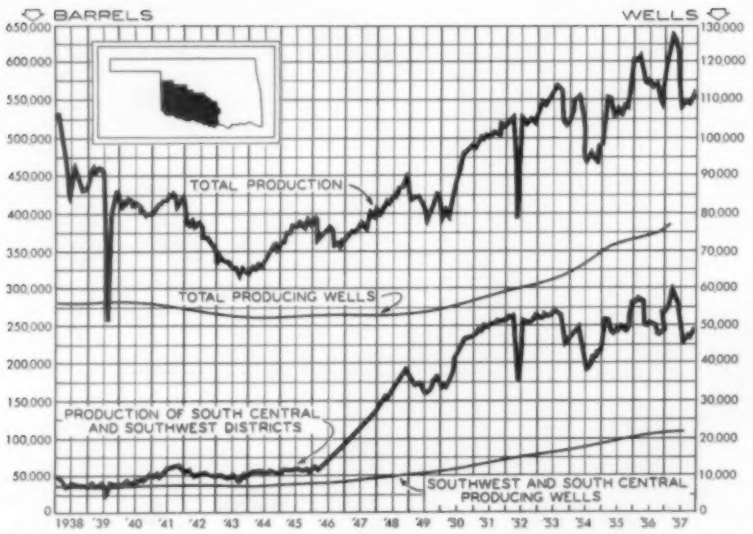
Deposition of the Deese series (Des Moinesan) ensued. The greater thickness of sediments was deposited to the east and north. Toward the close of this epoch the uplift of the western portion of Arbuckle Mountains had its inception simultaneously with a minor intensification of the Wichita-Criner trend. This relatively minor



period of diastrophism created the Robberson, Tatums, Knox, and Velma structures.

Arbuckle orogeny . . . After deposition of the Hoxbar sediments (Missourian), the second major uplift occurred—the Arbuckle orogeny. At this time, the Arbuckle Mountains were molded into their present shape. The Wichita-Criner trend underwent still further uplifting. The Overbrook, Caddo, Brock, West Brock, Southwest Lone Grove, and Hewitt anticlines

PALEOGEOLOGIC MAP outlines the main positive trends that stretch across southern Oklahoma. Notice how the oil fields follow the structural trends. Fig. 2.



THE ROLE of the South Central and Southwest districts has increased markedly since 1938 when the two districts accounted for only 8 per cent of the state's total oil production. (Statistical data courtesy of Vance Rowe Reports.) Fig. 3.

were created. The Healdton and Loco anticlines were greatly intensified. In the western portion, further uplifting of the Wichita Mountains was accompanied by northeastward tilting. This resulted in the removal of pre-Cisco sediments from many areas to the southwest. During the Cisco, westward tilting caused the Criner Hills and Ardmore basin area to be positive, while deposition of Cisco strata took place in the Anadarko and Paloduro basins, lapping out against the positive Wichita Mountains.

Intense folding and thrust faulting were the dominant characteristics of the Arbuckle orogeny. The Wichita-Criner trend served as a buttress resisting the compressional movement of the intense Arbuckle Mountain rejuvenation. The resultant crustal shortening was most conspicuous in Carter County and eastern Stephens County. In this area of conjunction of the Admore and Anadarko basins the older structures were rejuvenated and new anticlines were formed. The result was the creation of an ideal environment, both stratigraphically and structurally, for the accumulation of oil.

Surface features . . . Although the Permian red beds tend to mask the steeply folded underlying Pennsylvanian strata, they do not obliterate the structural evidence of the latter entirely. In fact, most of the oil fields along the Wichita-Criner trend and many of those lying to the north were discovered either by oil seeps from the Permian exposures or surface noses or slightly closed anticlines.

These Permian noses and slightly closed anticlines overlay deeper-seated structures whose intensity usually increased with depth in the area of the Wichita-Criner trend. In many cases (e.g. Loco pool, 3s-5w) recurrent earlier structural upheavals caused the better reservoir beds to be truncated or not given an opportunity to be deposited. In other cases (e.g. Hobart field, 7n-17w), good porosity is present but is juxtaposed to terrestrial deposits and poor seals and poor source beds.

Fig. 2 reveals that the Simpson group is truncated from the crest of nearly all of the Wichita-Criner Hills trend west of the Healdton structure. It is quite possible that good Bromide sandstone development may have existed at various localities on this trend prior to its removal by erosion. Approximately 100 ft. of porous Bromide sandstone is found in the subsurface in 23, 26, 35, and 36-1s-5w. Forty feet of Bromide sandstone is present in the NW NW SW 5-3s-4w, northeast of the Loco pool.

Over 250 ft. of very porous Bromide sandstone is present in North Fort Sill pool (4n-11w), Apache field (5n-12w). Northeast Alden field (6n-13w), and Hobart pool (7n-17w). The absence of Bromide sandstone in 5s-1w and 4s-3w does not preclude its former existence, prior to erosion, on the trend northwest of Healdton. For example, on the outcrops of the Criner Hills, there is no development or porosity in the Oil Creek member of the Simpson. Yet at Enville field in 7s-3e, about 10 miles southeast of the Criner Hills, The Texas Co. discovered over 80 ft. of very porous Oil Creek sandstone to be present and productive.

In Fig. 1 only the major faults are shown because of the scale of the illustration. It is believed that the Meers Valley fault, separating the Arbuckle and Precambrian rocks of the Wichita Mountains, extends eastward to the north side of the Arbuckle Mountains. Another major fault extends from the north side of Hewitt field (4s-2w) along the north flank of the Criner-Wichita trend northwestward toward Northeast Alden field and thence westward, along the south edge of the Anadarko basin. Both of these faults were created during the Wichita orogeny and were rejuvenated during the Arbuckle orogeny.

Important producing areas . . . Three townships on this trend were ideally located both structurally and stratigraphically: Healdton field (4s-3w) has a cumulative recovery of over 228 million barrels; Hewitt field (4s-2w), over 132 million; and the West-Brock-Southwest Lone Grove fields (5s-1w) have jointly over 19 million barrels cumulative recovery. Healdton is productive from sandstones in the Middle Hoxbar. Hewitt, Southwest Lone Grove, and West Brock are productive primarily from lower Hoxbar and upper Deese. Pre-Pennsylvanian production in these four fields is marginal since the Simpson group is lacking in porosity.

Ten fields in western Carter County and eastern Stephens County have been nomenclaturally combined to form Sho-Vel-Tum field because all are now contiguous. These fields are: Velma (1 and 2s-3 to 5w), Sholem-Alechem (1 and 2s-3 and 4w), North Alma (1s-4w), Milroy (2s-3 and 4w), Fox (2s-3w), Graham (2 and 3s-2 and 3w), Tatums (1s-2 and 3w), and Wildcat Jim (2s-2w). Sho-Vel-Tum field has a cumulative recovery of more than 300 million barrels of oil. Its (October 1957) daily average production was 74,109 bbl. of oil.

The Springer sandstone discoveries at Velma (1944) by Skelly and at Sholem-Alechem (1947) by Stanolind, now Pan American Petroleum Corp., are overwhelmingly the most important events in the history of Sho-Vel-Tum field. The Velma Springer production is the result of a 13-mile belt of Springer sandstone truncated on the east flank of the Velma horst and the north flank of the Milroy anticline. Petroliferous Deese shales form the seal. The Springer production at Sholem-Alechem is derived primarily from the nontruncated Sims sand. Here the post-Hoxbar crest has shifted to the northeast of the pre-Atokan

crest because of the differing effects of the Arbuckle and Wichita orogenies respectively.

Although only indirectly related to the subject area, the Golden Trend field (extending from 5n-5w to 1n-1w) has recovered over 132 million barrels of oil. Other prolific producers are: Apache field, 5 and 6n-12w (recovery 22½ million barrels); Cement field, 5 and 6n-9 and 10w (recovery over 88 million barrels); Doyle field, 1n-4 and 5w (recovery 17 million barrels); and Eola field, 1n-2 and 3w (recovery 15½ million barrels).

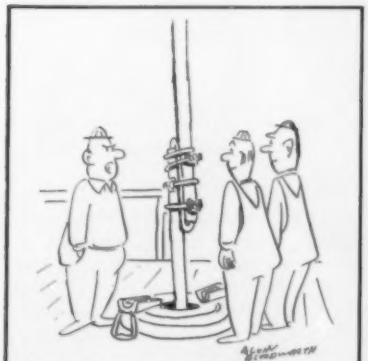
Elk City field, although about 15 miles northwest of the edge of the illustrations, is intimately related geologically with the Wichita trend. It has produced nearly 47 million barrels of oil from the post-Atokan granite washes. Shell Oil Co. is currently drilling at 13,800 ft. on a proposed Ordovician test on this structure in the center of SW 16-10n-21w.

Knox field (2, 3 and 4n-5 and 6w) has a cumulative recovery of over 33 million barrels of oil. The confirmed high potential and productivity of the Simpson sandstones, opened up by British-American, make it seem likely that the field will ultimately pass the 100-million-barrel mark and join the ranks of the major oil fields of the country.

Vast potential . . . The tremendous importance in recent years of the pre-Atokan strata can be seen in Fig. 3. The preponderance of pre-Atokan production has been discovered in the last 10 years. To date, most of this production has been found in the Springer sandstones. It is possible that the Ordovician may emerge as the dominant producing horizon of this region in the next 10 years.

It is interesting to note on Fig. 3 that the South Central and Southwest districts accounted for only 8 per cent of Oklahoma's daily average production of 507,725 bbl. in 1938. Today they account for 45 per cent of the state's 1956 production of 581,520 daily average barrels of oil.

The theme of this article has been a review of pre-Atokan production and its future possibilities. It will take a lot of disciplined, imaginative thinking and new interpretations to find new and deeper reservoirs. Since, at best, the odds are in favor of the wildcat wells being dry holes, a lot of courage will be required. Discovery thinking and courage of this type were required to find the Springer production of Velma and Sholem-Alechem and, more recently, the Ordovician production on Enville and Knox.



"I thank you guys for wantin' to save the company money, but—"

Acknowledgment

The writer expresses his gratitude to Vance Rowe and to Petroleum Statistical Guide, Inc., for enabling the compilation of the production statistics. Illustrations are courtesy of Mercury Drilling Co.

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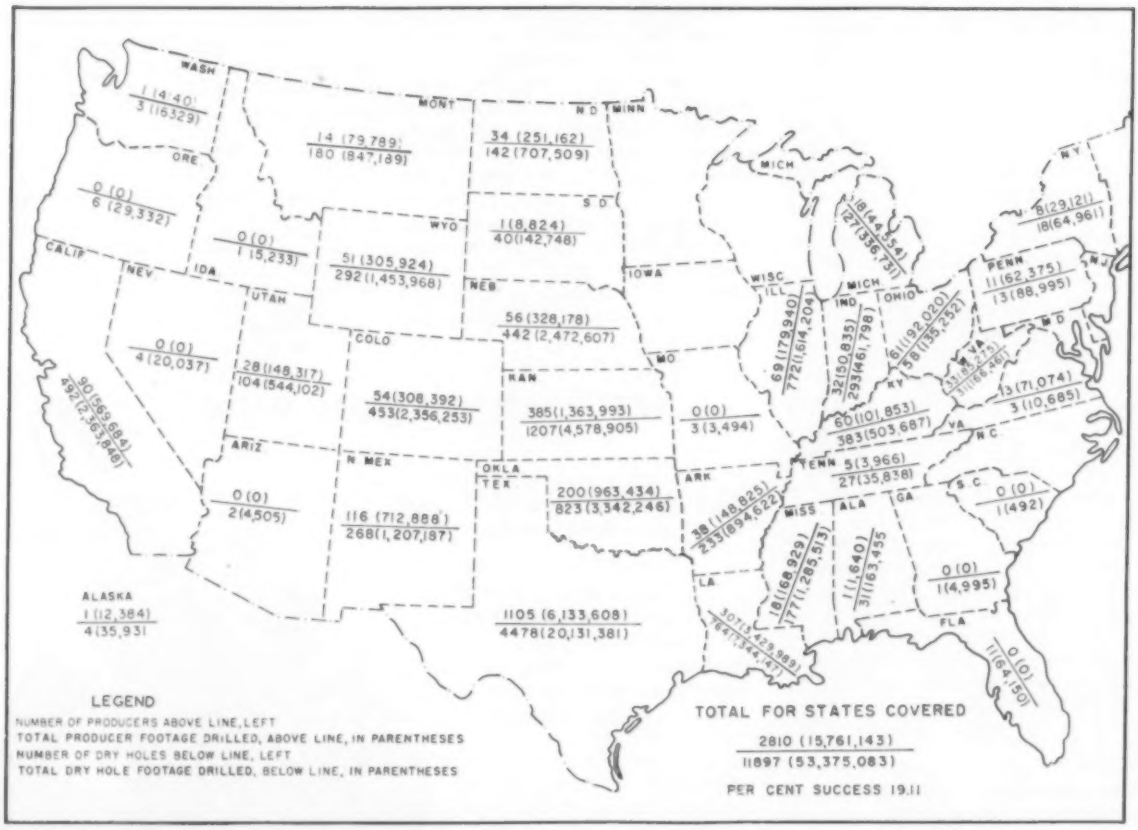


STATE-BY-STATE breakdown of exploratory wells drilled in 1957, showing number of producers, producer footage drilled, number of dry holes, and footage of the dusters. Fig. 1.

WILDCAT SCOREBOARD for '57

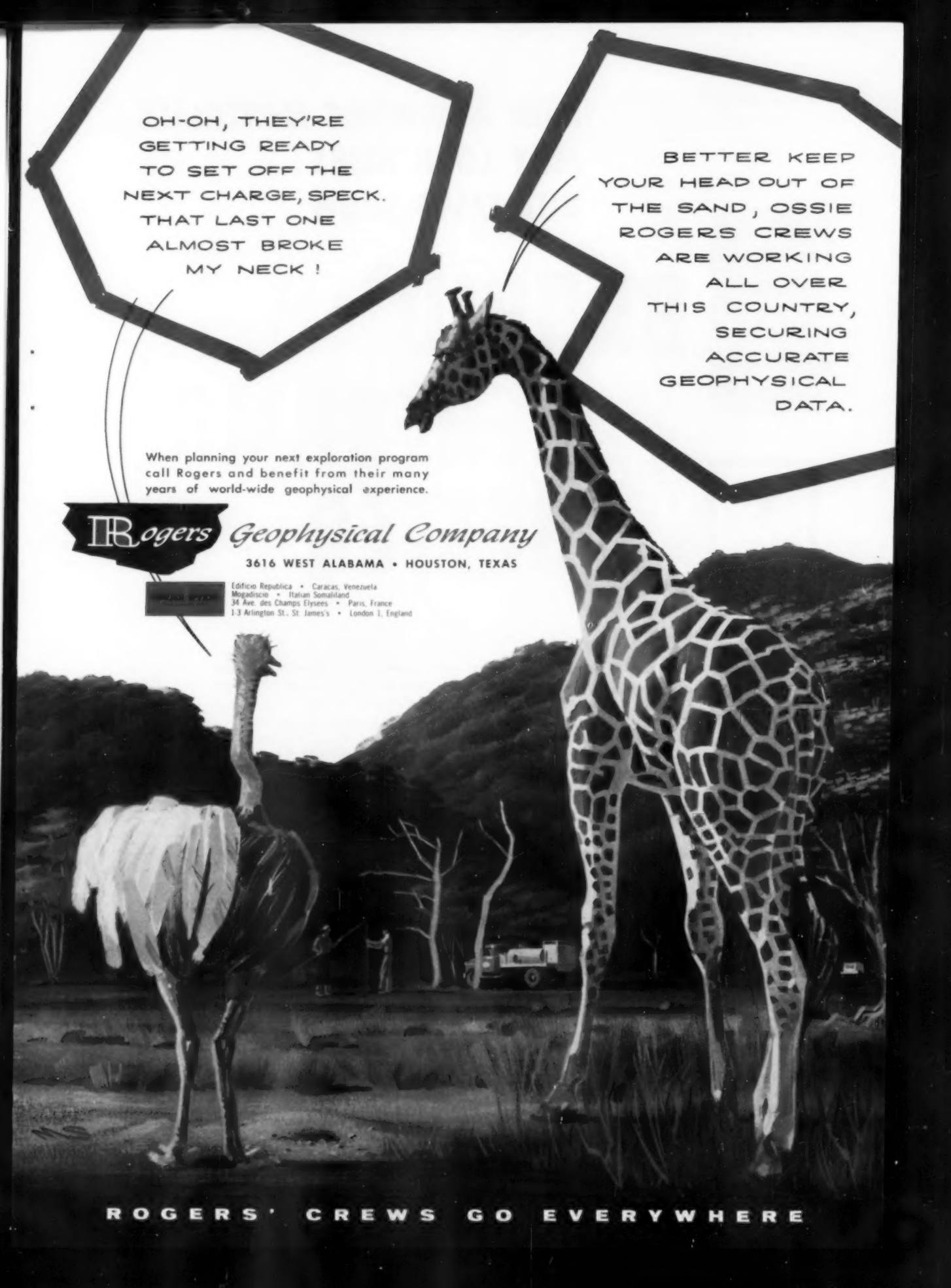
- **Total exploratory tests; 14,707—down 1,466**
- **Average depth: 4,701—127 feet deeper**
- **Average depth of new field, or rank wildcats: 4,873 ft.—59 feet deeper than in 1956**

BY B. W. BLANPIED

This abridgement of the report of the chairman of the AAPG Committee on Statistics of Exploratory Drilling, presented before the business committee at the association's annual meeting in Los Angeles, March 10-13, is published by special permission of the author and AAPG. The full report will be published in the June 1958, Bulletin of the AAPG.

IN THE LAST 14 years in the United States "rank" wildcats have comprised approximately 55 per cent of the total number of exploratory holes. Of these new-field wildcats, during this period, the percentage located on technical advice has risen from 77 per cent to 82 per cent. In this same period nearly three times as many new-field wildcats have been successful when located on technical advice as those not so located. Taking all new-field wildcats into consideration there has been an almost constant success-to-failure ratio. The average for the 14 years has been 11.18 per cent, with a range from a low of 10.65 per cent to a high of 12.22 per cent. That is, one hole in every nine has found some oil or gas.

But even more significant than these figures has been our study of the total ultimate reserves of oil discovered by these new-field wildcats. Briefly, this study, which is based on fields having a minimum of 6 years of development history, shows that only 1 new-field wildcat out of every 44 drilled discovers a field with as much as 1 million barrels of estimated total ultimate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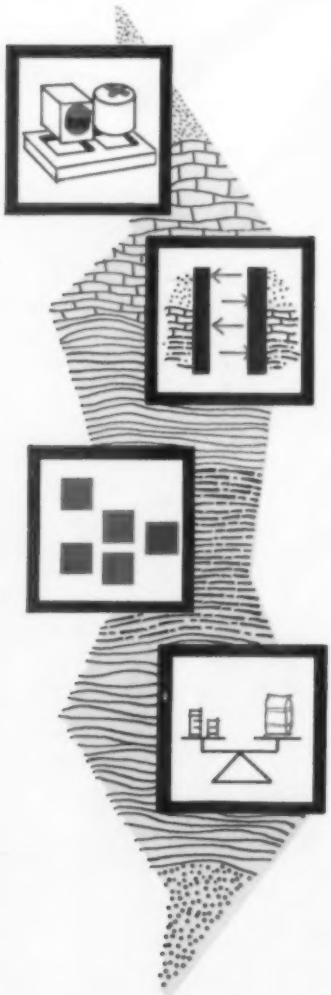

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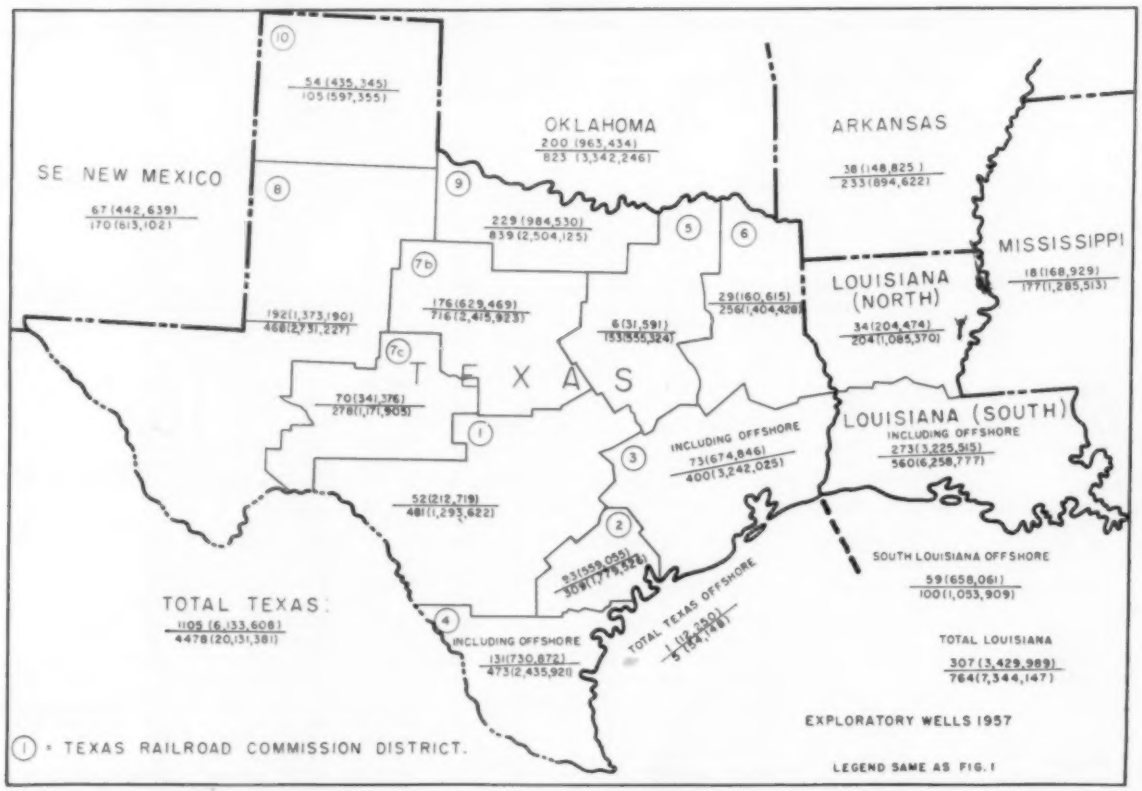
D 5012

"Nearly 98 per cent of all new-field wildcats are failures . . . because they are dry, or discover reserves too small to be profitable."



DISTRICT-BY-DISTRICT BREAKDOWN of exploratory wells drilled in the Southwest in 1957, by producers and dry holes, and footages. Fig. 2.

reserves. Nearly 98 per cent of all new-field wildcats drilled are failures in that they are abondoned as dry or they discover reserves too small, on the average, to be profitable.

Our committee has continued to use the classification of exploratory holes as outlined in Table 1. All holes are grouped according to their preliminary classification (I in Table 1)

Standard classification of wildcat wells—Table 1

				I. *Classification When Drilling Is Started*	II. *Classification after Completion or Abandonment*	
					Successful	*Unsuccessful*
				A	B	C
Drilling for *lone extension* of partly developed pool				1 Outpost (Extension test)	1 Extension well (Sometimes a new-pool discovery well)	1 Dry outpost (Dry extension test)
Drilling for a *new pool* on a structure or in a geological environment already productive	New-pool tests	Drilling within limits of proved area of pool	For new pool *above* deepest pool	2a Shallower-pool test	2a Shallower-pool discovery well (Sometimes shallower-pool extension well)	2a Dry shallower-pool test
			For new pool *below* deepest pool	2b Deeper-pool test	2b Deeper-pool discovery well (Sometimes deeper-pool extension)	2b Dry deeper-pool test
		Drilling outside limits of proved area of pool		2c New-pool wildcat	2c New-pool discovery wildcat (Sometimes an extension well)	2c Dry new-pool wildcat
Drilling for a *new field* (on a structure or in an environment never before productive)				3 New-field wildcat	3 New-field discovery wildcat	3 Dry new-field wildcat

New-pool discovery wells (Or, in places, extension wells)

Dry new pool tests

THE AUTHOR

B. W. Blanpied acted as chairman of the Committee on Statistics of Exploratory Drilling for this twenty-second annual report. Graham B. Moody prepared this analysis for the year of 1956 following Dr. F. H. Lahee who was chairman for 20 years.

Blanpied is presently staff geologist, Houston production division, Gulf Oil Corp. He was employed as geologist by Gulf in 1922, Shreveport district; he became chief district geologist and later was manager of exploration. Prior to joining Gulf he was geologist for Empire Gas & Fuel Co. and Pure Oil Co. He became a member of the AAPG in 1923; is also a Fellow of both the Geological Society of America and the American Association for the Advancement of Science.

Oilers, gassers, condensate wells, and dusters in U.S. and Alaska—Table 2

(Drilled as exploratory tests)

States—	Oil producers		Gas producers		Condensate producers		Total producers		Dry holes		Grand total		Avg. hole depth*
	No. of holes	Footage	No. of holes	Footage	No. of holes	Footage	No. of holes	Footage	No. of holes	Footage	No. of holes	Footage	
Alaska	1	12,384	0	0	0	0	1	12,384	4	35,931	5	48,315	
Alabama	0	0	1	1,640	0	0	1	1,604	31	163,455	32	165,095	5,159
Arizona	0	0	0	0	0	0	0	0	2	4,505	2	4,505	
Arkansas	31	115,845	7	32,980	0	0	38	148,825	233	894,622	271	1,043,447	3,850
California	74	477,873	16	91,811	0	0	90	569,684	492	2,363,848	582	2,933,532	5,040
Colorado	31	171,616	23	136,776	0	0	54	308,392	453	2,356,253	507	2,664,645	5,256
Florida	0	0	0	0	0	0	0	0	11	64,150	11	64,150	
Georgia	0	0	0	0	0	0	0	0	1	4,995	1	4,995	
Idaho	0	0	0	0	0	0	0	0	1	5,233	1	5,233	
Illinois	67	178,470	2	1,470	0	0	69	179,940	772	1,614,204	841	1,794,144	2,133
Indiana	32	50,835	0	0	0	0	32	50,835	293	461,798	325	512,633	1,577
Kansas	320	1,068,214	65	295,779	0	0	385	1,363,993	1,207	4,578,905	1,592	5,942,898	3,733
Kentucky	47	66,561	12	30,466	1	4,826	60	101,853	393	503,687	453	605,540	1,337
Louisiana	138	1,432,181	37	396,103	132	1,601,705	307	3,429,989	764	7,344,147	1,071	10,774,136	10,060
Michigan	14	31,579	4	12,975	0	0	18	44,554	127	336,731	145	381,285	2,630
Mississippi	16	146,053	0	0	2	22,876	18	168,929	177	1,285,513	195	1,454,442	7,459
Missouri	0	0	0	0	0	0	0	0	3	3,494	3	3,494	
Montana	11	70,688	3	9,131	0	0	14	79,819	180	847,189	194	927,008	4,778
Nebraska	54	319,656	2	8,522	0	0	56	328,178	442	2,472,607	498	2,800,785	5,624
Nevada	0	0	0	0	0	0	0	0	4	20,037	4	20,037	
New Mexico	87	523,945	11	50,788	18	138,155	116	712,888	268	1,207,187	384	1,920,075	5,000
New York	0	0	8	29,121	0	0	8	29,121	18	64,961	26	94,082	3,619
North Dakota	34	251,162	0	0	0	0	34	251,162	142	707,509	176	958,671	5,447
Ohio	28	86,714	33	105,306	0	0	61	192,020	58	135,252	119	327,272	2,750
Oklahoma	145	649,372	43	220,412	12	93,650	200	963,434	823	3,342,246	1,023	4,305,680	4,209
Oregon	0	0	0	0	0	0	0	0	6	29,332	6	29,332	
Pennsylvania	0	0	11	62,375	0	0	11	62,375	13	88,995	24	151,370	
South Carolina	0	0	0	0	0	0	0	0	1	492	1	492	
South Dakota	1	8,824	0	0	0	0	1	8,824	40	142,748	41	151,572	3,697
Tennessee	0	0	5	3,966	0	0	5	3,966	27	35,838	32	39,804	1,244
Texas	758	3,822,325	199	1,067,831	148	1,243,452	1,105	6,133,608	4,478	20,131,381	5,583	26,264,989	4,704
Utah	17	102,173	11	46,144	0	0	28	148,317	104	544,102	132	692,419	5,246
Virginia	0	0	13	71,074	0	0	13	71,074	3	10,685	16	81,759	
Washington	1	4,140	0	0	0	0	1	4,140	3	16,329	4	20,469	
West Virginia	5	7,051	28	78,224	0	0	33	85,275	31	102,754	64	188,029	2,938
Wyoming	33	196,521	16	90,813	2	18,590	51	305,924	292	1,453,968	343	1,759,892	5,131
Total	1,945	9,794,182	550	2,843,707	315	3,123,254	2,810	15,761,143	11,897	53,375,083	14,707	69,136,226	4,701

*Average per well footage given only where 25 or more wells were drilled in the state.

whether or not their original objective is attained. Under this classification (I), the holes are then grouped according to their completion classification (II in Table 1). It is to be noted that, while a majority of outposts, or, as we may also call them, "extension tests," if successful, are completed as extension wells, some discover new pools and therefore are completed as new-pool discovery wells. Similarly, any type of new-pool tests, if successful, may be completed as an extension well rather than as a new-pool discovery well. These possibilities are indicated in parentheses under Col. B, 2a, 2b, and 2c, in Table 1.

In the states (Alaska included for the first time) covered in this review, as shown in Fig. 1 and listed in Table 2, during 1957, a total of 69, 136, 226 ft. was drilled in 14,707 exploratory holes, divided as follows.

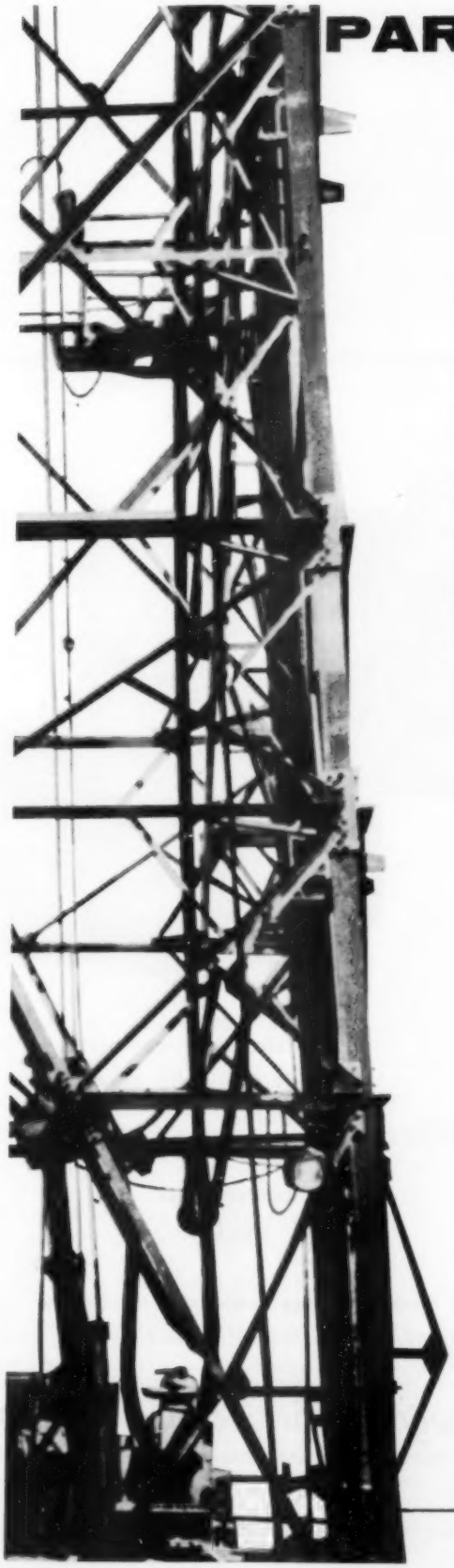
	Ft.
2,810 producers	15,761,143
11,897 dry holes	53,375,083

This means that 19.11 per cent of the holes drilled, and 22.80 per cent of the footage drilled, were successful in 1957. One producer foot was drilled for every 3.39 ft. of dry hole. One successful well was drilled for every 4.23 dry holes. The average depth of hole was 4,701 ft. (Slightly more than in the previous year.)

Reasons for drilling . . . In Table 3 are listed the reasons for drilling the new-field wildcats in 1957, by using the best information available from men familiar with such statistics, each in his own state or district. According to these figures 735 new-field wildcats drilled on technical advice (geology or geophysics or both) were successful, and 5,841 were dry; 26 holes, located for nontechnical reasons, were producers, and 524 were dry; 111 producers and 777 dry holes were located for reasons unknown. The figures show that 11.2 per cent of the new-field wildcats drilled on technical advice were producers as contrasted with 4.7 per cent successful in the case of holes located without technical advice. Therefore, in 1957, locations for new-field wildcats based on technical recommendations were 2.36 times as successful as those drilled without such advice. Seismographic methods were largely responsible in locating 290 producers and 1,461 dry holes among the new-field wildcats.

Table 5 will be of interest for it shows the relative success, as measured by the number of producers in comparison with the number of dry holes, in each year from 1944 to 1957, inclusive.

As indicated in Table 1, a hole may be located as an outpost with the intention of trying to extend a pool partly developed, but instead it may discover a new pool; and, similarly, a new-pool wildcat may be located in search of a new pool because it is believed to be well outside the limits of the known pool, but instead it may result in extending this known pool farther than had been expected. A majority of outposts, if successful, are completed as extension wells and a majority of new-pool wildcats, if successful, discover new pools. There were 883 outposts completed as extension wells and 201 were completed



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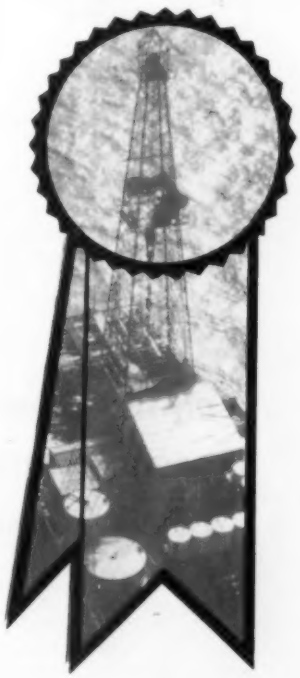

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Basis for locating 1957 new-field wildcats in U.S. and Alaska—Table 3

States—	Geology		Geophysics		Geology and geophysics		Sundry nontechnical		Unknown		Total		Grand total
	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	
Alaska	0	0	1	1	0	0	0	0	0	3	1	4	5
Alabama	1	12	0	3	0	7	0	9	0	0	1	31	32
Arizona	0	2	0	0	0	0	0	0	0	0	0	2	2
Arkansas	8	133	0	1	2	7	0	0	0	10	10	151	161
California	5	120	0	11	4	44	0	45	0	10	9	230	239
Colorado	21	196	6	52	8	76	2	74	1	23	38	421	459
Florida	0	4	0	3	0	0	0	4	0	0	0	11	11
Georgia	0	0	0	*1	0	0	0	0	0	0	0	1	1
Idaho	0	1	0	0	0	0	0	0	0	0	0	1	1
Illinois	15	319	0	2	0	0	0	6	1	6	16	333	349
Indiana	6	198	0	0	0	0	0	0	0	0	6	198	204
Kansas	12	140	3	55	1	7	1	0	1	38	18	240	258
Kentucky	4	0	0	0	0	0	1	0	2	8	7	8	15
Louisiana	13	143	16	37	43	235	0	0	0	0	72	415	487
Michigan	8	94	0	*5	0	0	1	0	0	0	9	99	108
Mississippi	5	112	4	24	2	21	0	5	0	0	11	162	173
Missouri	0	1	0	0	0	0	0	0	0	1	0	2	2
Montana	0	88	5	53	0	24	0	7	0	0	5	172	177
Nebraska	20	93	5	32	0	3	14	239	2	41	41	408	449
Nevada	0	2	0	1	0	0	0	1	0	0	0	4	4
New Mexico	21	159	0	10	10	25	0	0	0	6	31	200	231
New York	3	7	0	0	0	2	0	1	1	2	4	12	16
North Dakota	6	66	0	0	12	72	0	0	0	0	18	138	156
Ohio	1	2	0	2	0	0	0	1	0	1	1	6	7
Oklahoma	42	286	4	9	9	20	0	0	0	0	55	315	370
Oregon	0	3	0	0	0	0	0	1	0	2	0	6	6
Pennsylvania	1	1	1	0	1	0	0	1	2	3	5	5	10
South Carolina	0	0	0	0	0	0	0	0	0	1	0	1	1
South Dakota	0	10	0	0	0	25	0	3	0	2	0	40	40
Tennessee	0	23	0	0	0	0	0	0	0	1	0	24	24
Texas	240	2,022	*63	136	71	328	7	93	99	589	480	3,168	3,648
Utah	6	43	3	25	2	18	0	6	0	0	11	92	103
Washington	0	0	0	3	1	0	0	0	0	0	1	3	4
West Virginia	1	6	0	0	0	2	0	0	0	1	1	9	10
Wyoming	6	94	3	31	10	48	0	28	2	29	21	230	251
Total	445	4,380	114	497	176	964	26	524	111	777	872	7,142	8,014

*Includes one well location based on geochemistry.

as new-pool discoveries; and 500 new-pool wildcats discovered new pools whereas 109 new-pool wildcats were completed as extension wells.*

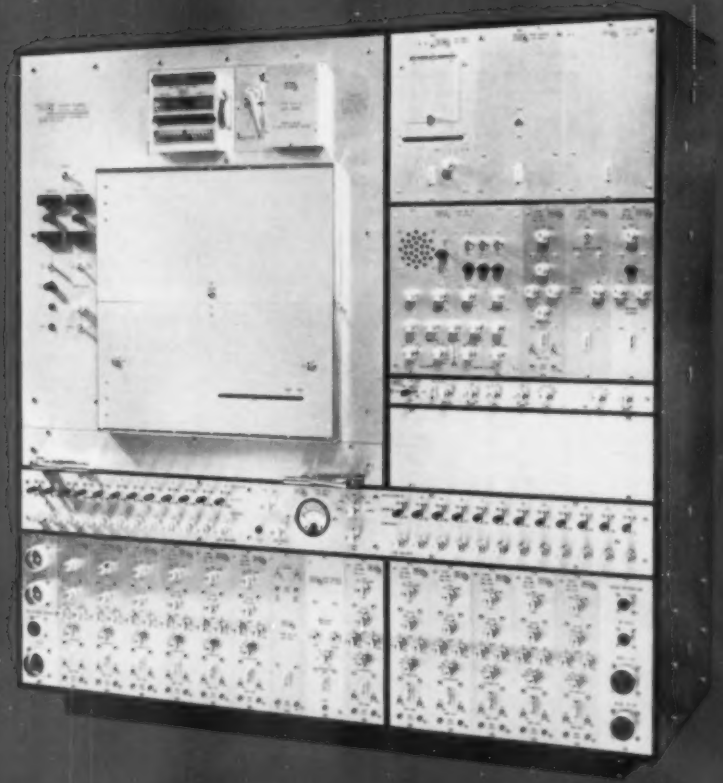
Old wells worked over (OWWO) were important in new field and new pool discoveries during the year. Twenty new-field wildcat discoveries included 14 oil, 2 gas, and 4 condensate wells. New-pool extension wildcats included two oil and one gas completion; one outpost extension oil well was completed. One oil well and three gas wells were completed by OWWO as new pool discovery wells. One OWWO in Arizona was a helium-gas discovery.

The successful exploratory completions include a number of dual and triple completions. When such wells included an oil-well completion they were included with the oil wells. Of the new-pool wildcats, one included a new-pool extension oil well. One triple-completed oil well was included and two oil wells dually completed with gas. One extension new pool wildcat oil well was dually completed with gas. Of the dual and triple outpost completions, three dual new-pool oil wells and one triple new-pool well were included. Also two dually completed oil wells with gas. One dually completed condensate new-pool well was also an extension condensate discovery. Outpost extension wells in-

*The new-pool discoveries referred to in this paper are all the result of exploratory drilling. In addition to these, at least 136 new pools were discovered in the drilling of field-development wells. These included 105 discoveries of oil (including one oil well dual with gas), 23 of gas, and 8 of condensate. One of the best oil discoveries in southwest Texas resulted from a field development well, producing oil from a reservoir already producing gas.

New-field wildcat footage—U.S. and Alaska—Table 4

	No. of producers	No. of dry holes	Total producers and dry holes	Total feet drilled in producers	Total feet drilled in dry holes	Total feet drilled in all new-field wildcats	Average depth of new-field wildcats
1944	342	2,752	3,094	1,640,473	11,356,749	12,997,222	4,200
1945	352	2,685	3,037	1,789,392	11,579,385	13,368,777	4,402
1946	333	2,800	3,133	1,692,977	10,862,145	12,555,122	4,007
1947	394	3,086	3,480	2,096,864	12,520,723	14,617,587	4,200
1948	501	3,795	4,296	2,690,951	16,049,313	18,740,264	4,362
1949	506	3,943	4,449	2,786,774	15,372,983	18,159,757	4,082
1950	592	4,698	5,290	3,146,090	18,972,164	22,118,254	4,177
1951	684	5,505	6,189	3,831,263	24,116,951	27,948,214	4,516
1952	741	5,957	6,698	4,433,191	28,068,745	32,501,934	4,852
1953	774	6,151	6,925	4,533,801	29,321,262	33,855,063	4,889
1954	902	6,478	7,380	5,339,001	30,145,436	35,484,437	4,808
1955	918	7,186	8,104	5,316,859	33,654,112	38,970,971	4,809
1956	868	7,841	8,709	5,482,958	36,439,685	41,922,643	4,814
1957	872	7,142	8,014	5,503,173	33,547,592	39,050,765	4,873



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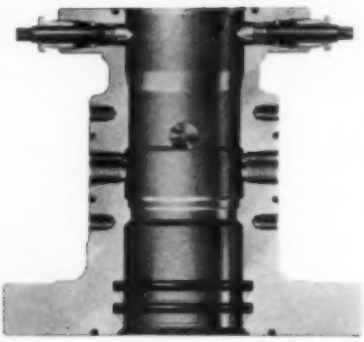

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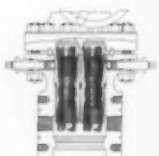

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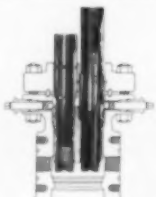

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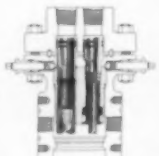

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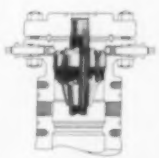

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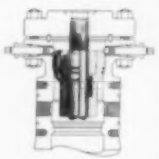

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"In 1957, locations for new-field wildcats based on technical recommendations were 2.36 times as successful as those without them."

TABLE 5—FIELDS* DISCOVERED IN 1951 AND 1954 GROUPED ACCORDING TO THEIR TOTAL ULTIMATE RESERVES AS ESTIMATED JANUARY 1, 1958

	Number of fields discovered in year indicated by reserves groups†						Total A–F inclusive	A+B +C fields	Percentage of A+B+C fields in total fields
	A	B	C	D	E	F			
1951	1	6	15	105	371	104	602	22	3.65
1954	3	3	15	90	399	111	621	21	3.38

*This table refers only to the states of Alabama, Arkansas, California, Colorado, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Montana, Nebraska, New Mexico, Oklahoma, Texas, and Wyoming. It does not include gas fields unless natural gas liquids are produced, and then the reserves figure relates only to these liquids. A few fields were omitted because of inadequate estimates, and a few producing areas, at first thought to be new fields, have become consolidated with other fields.

†In this table, A means 50 million barrels or more, B means between 25 and 50 million barrels, C means between 10 and 25 million barrels, D means between 1 and 10 million barrels, E means less than 1 million barrels, F means abandoned.

cluded 2 oil wells also dually completed as new-pool discovery wells, 3 dual oil-and-condensate, and 15 oil wells dually completed with gas. Shallow pool tests included two oil wells completed dually with gas as new pool discoveries.

Evaluating former discoveries . . . Some years ago we included in our annual report a table showing the number of fields discovered each year, from 1938 to the year preceding the year reported, these fields, from 17 states, being grouped according to a rough estimate of their total ultimate reserves from the date of discovery. The fields were grouped according to these estimates: "A" meaning a total ultimate of 50 million barrels or more; "B", from 25 to 50 million barrels; "C", from 10 to 25 million barrels; "B", from one to 10 million barrels; "E", less than one million barrels; and "F", abandoned. Gas fields were not included unless they also produced oil or condensate. A few fields were omitted where satisfactory estimates were not readily obtainable. This lengthy tabulation has been discontinued but new-field discoveries in the 17 states in 1957 are classified as:

13 C's, 156 D's, 550 E's, 19 F's and 101 gas fields.

Besides the 17 states considered in the past, in the estimate of reserves, we now have Utah and North Dakota estimates, and including Alaska and Washington we can add the following rough estimates for 1957 new-field discoveries:

3 B's, 1 C, 2 D's, 21 E's and 4 gas fields.

In the present report we are repeating the approach followed in 1956. In other words, we are recording, in Table 5, estimated total ultimate reserves for only the discoveries of 1951 and 1954. Where necessary, revisions have been made of the earlier estimates of these fields discovered in those years. In revising these earlier estimates for discoveries of 1951, as made 3 years ago, one A remained unchanged, one A was lowered to a B, and 7 A's were consolidated (Spraberry, a giant field in West Texas). One B remained unchanged. Five C's remained unchanged, two C's were raised to B, one C was lowered to D, and one C was lowered to E. Sixty-six D's remained unchanged, two D's were raised to B, eight D's were raised to C, seven D's were lowered to E, and six D's were consolidated. And 341 E's remained unchanged, 2 E's were raised to C, 36 E's were raised to D, 48 E's were lowered to F, and 22 E's were consolidated. And 18 F's remained unchanged, 13 F's became E's, and 2 F's were consolidated. And 58 gas fields remained unchanged, 2 gas fields were raised to D's, 9 gas fields became E's, and 1 gas field was consolidated, hence, no discovery.

In revising the January 1, 1955, estimates of the 1954 discoveries, four C's remained unchanged, one C became an A, and four C's were lowered to D. And 38 D's remained unchanged, 2 D's were raised to A, 3 D's were raised to B, 4 D's raised to C, 15 D's were lowered to E, 1 D to F, and 4 D's were consolidated. And 369 E's remained unchanged, 4 E's became C's, 43 E's were raised to D, and 91 E's were lowered to F. And 1 E became a gas field and 23 E's were consolidated. And 14 F's were unchanged, 1 F became and E, and 2 F's were consolidated. And 128 gas fields remained unchanged, 1 gas field was raised to C, 4 gas fields were raised to D, 14 gas fields were raised to E, 5 gas fields became F's, and three gas fields were consolidated, hence, no discovery.

(For Canadian details, see page 232)

Basis for locating new-field wildcats in U.S. and Alaska since 1944—Table 6

	Geology		Geophysics*		Geology and geophysics		Total technical		Nontechnical		Unknown		Total		
	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Producers	Dry holes	Grand total
1944	148	1,328	108	589	40	177	296	2,094	38	570	8	88	342	2,752	3,094
1945	180	1,488	89	468	53	220	322	2,176	17	302	13	207	352	2,685	3,037
1945	154	1,584	91	413	57	211	302	2,208	10	363	21	229	333	2,800	3,133
1947	200	1,691	101	516	63	293	364	2,500	15	389	15	197	394	3,086	3,480
1948	232	2,039	124	595	99	400	455	3,034	12	372	34	389	501	3,795	4,296
1949	222	2,133	180	650	62	360	464	3,143	11	367	30	433	506	3,943	4,449
1950	279	2,523	173	739	81	403	533	3,665	19	526	40	507	592	4,698	5,290
1951	311	2,932	208	990	86	556	605	4,478	16	375	63	652	684	5,505	6,189
1952	359	2,959	179	1,155	143	705	680	4,818	16	466	44	672	741	5,957	6,698
1953	368	3,227	221	1,086	100	745	689	5,058	21	426	64	667	774	6,151	6,925
1954	441	3,596	176	772	139	900	756	5,268	24	406	122	804	902	6,478	7,380
1955	454	4,176	149	755	183	968	786	5,899	32	411	100	876	918	7,186	8,104
1956	461	4,582	147	658	187	1,248	795	6,488	25	463	48	890	868	7,841	8,709
1957	445	4,380	114	497	176	964	735	5,841	26	524	111	777	872	7,142	8,014

*Includes a few holes based on geochemistry.

Geophysics

Discovery of stratigraphic traps by the REFLECTION SEISMOGRAPH

The author says . . .

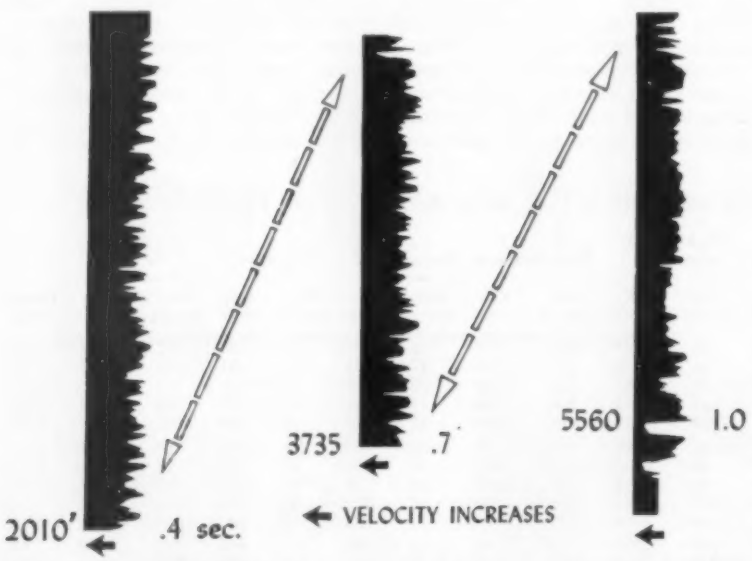
- In older producing areas, there are innumerable possibilities for oil production from stratigraphic traps at relatively low exploration costs.
- Most strat traps in the past have been accidental discoveries, not the result of scientific oil-finding efforts.
- Geophysical efforts have been successful in the past in mapping certain strat traps.
- New seismic techniques and instruments hold promise of making the routine discovery of certain types of strat traps a real possibility.

BY GERALD H. WESTBY
President, Seismograph Service Corp., Tulsa

IN OUR private-enterprise economy, the best method to rejuvenate and keep healthy the domestic oil business would be to find oil which could be produced at a price competitive with imported oil. Restrictions on the amount of imported oil, whether voluntary or by government decree, may be temporarily helpful. But since they could be changed at any time, imports would still represent a deterring hazard to the progressive expansion of the domestic oil business which is so vital to the welfare of our nation.

It is readily apparent that no economies or greater efficiency of our present orthodox methods of finding and developing oil would allow reasonable price competition of domestic crude with the present flood of cheap foreign oil.

The picture, however, is not entirely black. There exists a very reasonable possibility that in old areas which have been exhausted for structural accumulation of oil, where lease blocks are readily available, where pipelines are already in, oil in stratigraphic traps may be found at shallow depths with much of the hazard of finding of oil in structural traps eliminated.



A CONTINUOUS-VELOCITY LOG is easily converted into a reflection-coefficient log like this one from an Oklahoma well. By inspection it becomes obvious that the horizon at 5,560 ft. or 1.0 second should be, and actually is, an excellent reflector. Fig. 1.

Importance of strat traps . . . Let us look at this possibility. Competent oil men estimate that more than 20 per cent of the known oil reserves in the United States is in stratigraphic traps. It is probable that at least 50 per cent of the oil produced in the United States from Drake's day to the present was from stratigraphic traps. In Oklahoma, our Glenn pool, Burbank field, and the Bristow-Slick area are excellent examples of large stratigraphic-trap oil fields. East Texas field still maintains its No. 1 position in the world as the field from which the most oil has been produced. The most startling fact in regard to these stratigraphic trap fields is that they were found largely by random drilling!

Most of the world's oil reserves, some 80 per cent, have been found in anticlines, which are by far the easiest type of trap to locate by geological or geophysical means. The fact that the reserves in stratigraphic traps in the United States are so high, despite the fact that they were found by random drilling, must indicate that there should be more reserves hidden now in such traps than we have presently found in anticlines. Our problem is to devise means of discovering such traps with the comparable amount of success had in locating structures.

Early seismic efforts . . . Let us examine what has been done about find-

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ing stratigraphic traps by geophysical methods. The fascinating and promising possibility of finding a geophysical method to locate stratigraphic traps has intrigued geophysicists since the early thirties. However, of 33 references dating back to 1932 found by this writer, most suggest either geochemistry or electrical prospecting methods. Only seven discuss the application of the seismic method to the problem. One of these, W. T. Born,[1] in his presidential address to the Society of Exploration Geophysicists in 1941, some 17 years ago, points out that much of the seismic work of the future will be concerned with the location of stratigraphic traps, mainly of the type in which part of the closure is due to structure. He notes that Coalinga Nose field and East Coalinga field are discoveries resulting from a correct geological surmise of pinchout, followed by careful geophysical work which located the nose. He also states that updip convergence of the seismic horizons bounding a section known to contain productive zones may well point to the approximate location of a pinchout. This method was used in the Golden Trend area of Oklahoma some years later, as noted elsewhere in this article.

Seismic successes . . . Shortly after the West Edmond area was recognized as a stratigraphic accumulation in the Bois d'Arc section of the upper Hunton which pinched out to the east, the seismograph was used quite successfully to delineate this east limit. It could not be done exactly, but a zone of pinchout perhaps ½ mile wide was determined. For miles north and south and west of this line, acreage was purchased which later proved productive.

- In Canada, a similar use of the seismograph to determine the pinchout of the Rundle limestone is described by Hugo P. Renden[2] in an article concerning the Majeau Lake Alberta field.
- J. R. Hill[3] reports an interesting use of the seismograph to help delineate a stratigraphic trap field in the "Geophysical History of the Golden Trend Area of Oklahoma." In early 1946 the Globe-Vickers 1 Gibson, Section 20-3n-2w, was drilled to the Simpson sands which were found nonproductive; the well was plugged back and completed as a good producer in the Deese sand section of the Lower Pennsylvanian. From seismic studies of the area, some from records 15 years old, oil finders recognized that this accumulation was probably stratigraphic. Careful isopach studies of the Pennsylvanian-pre-Pennsylvanian interval provided a guide to the fur-

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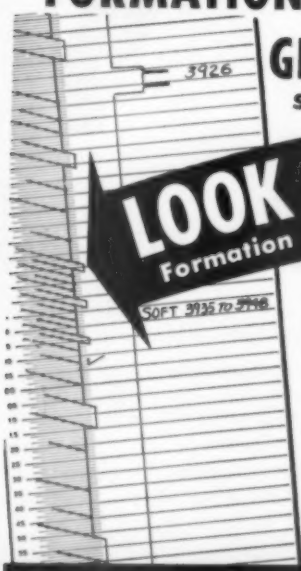

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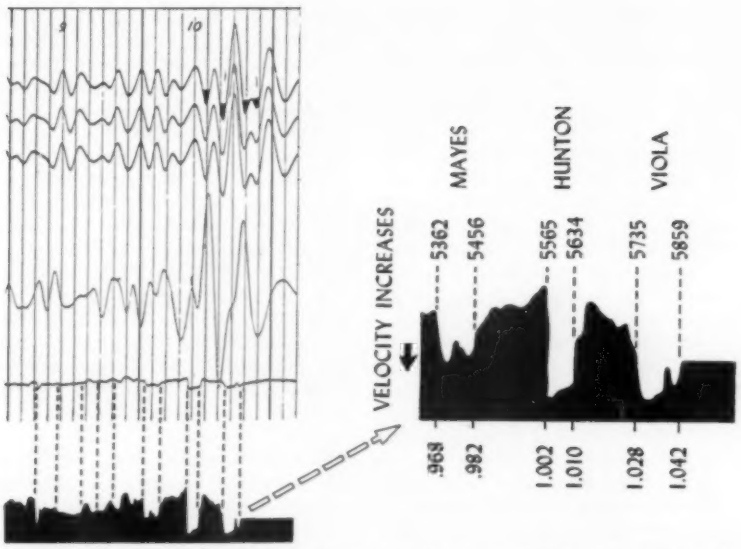
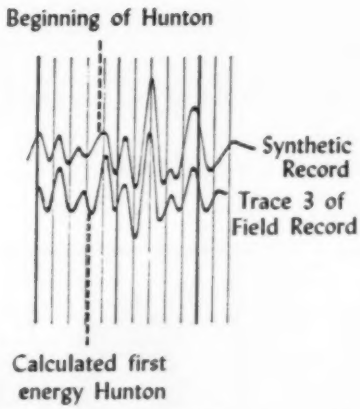
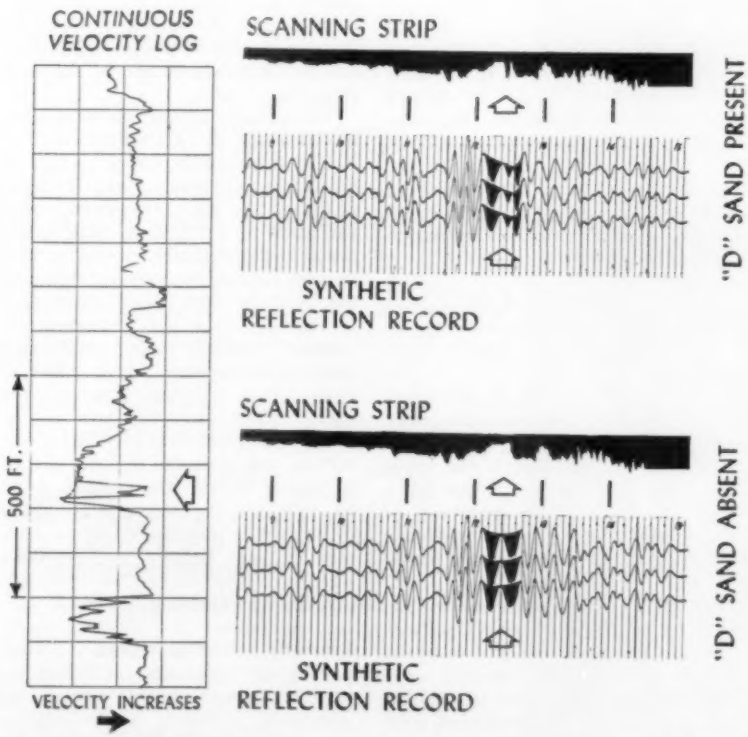


THE TOP THREE TRACES in the left figure are the synthetic seismic record made from the reflection-coefficient log at the bottom. A portion of the latter is enlarged in Fig. 3 at right. Fig. 2.



THE SYNTHETIC RECORD compares excellently with a field record shot over the well. Fig. 3.

ther extension of the Deese-sand pinchout and location of other possibly productive areas. In November 1946, Carter Oil Co. discovered oil in the 1 Burford, the discovery well in the Katy pool, 1n-1w; this wildcat was planned as a Deese stratigraphic sand test and located from seismic studies of the section. The Burford was such a distance from previous productive Deese wells at the time that it can be regarded as, if not the first, at least one of the first wells ever drilled as a stratigraphic test from seismic data that hit its target. This is an excellent exhibit of fruitful geological-geophysical reasoning and a striking example of the use of old seismic data to provide a new type of information.



CONTINUOUS-VELOCITY LOG at left was run in a well where the D sand was present. Synthetic record at upper right has the D sand; synthetic record at lower right shows a shale section in place of the D sand. Fig. 4.

Ceres sandbar . . . While there are many types of stratigraphic traps, most of them are only partially stratigraphic, and structure is required to complete the closure. Perhaps the Ceres pool, in Noble County, Oklahoma, a narrow (approximately 1,000 ft. wide) and up to 60-ft.-thick sand bar, trending northeast-southwest on a somewhat sinuous course, is a pure stratigraphic trap.

A seismic method was devised to locate this sand bar by utilizing the variation in interval between a limestone reflection above the sand and one below. Since such an interval is devoid of surface errors and is the most accurate measurement to be made by the reflection seismograph, isopach maps of 0.002 second interval were prepared and studied. Some initial success attended the effort.

The theory then proposed for explaining the anomaly, a thickening of the isopach map at the position of the bar, was a velocity contrast between the shale and the sand which had replaced it locally in the geologic section. It was postulated that the liquid content of the sand, either water or oil, lowered its velocity so drastically that a time delay in the reflection path through the sand was very appreciable. It was also noted that part of the anomaly was due to drape of the reflecting limestone at the top over the sandstone bar.

A careful reexamination of this method indicates that the time delay theory was in error. Many continuous-velocity logs have revealed that a fluid-filled Burbank sand still has a

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velocity higher than the surrounding shale. It is now apparent that the limited success of the method was due to the drape by differential compaction of the upper reflecting horizon over the sand bar. Such drape was quite appreciable, particularly when the interval or isopach method was used. As soon as the sand bar spread out to the north and lost its narrow, thick configuration, it could no longer be satisfactorily followed, since the drape of the limestone above was no longer apparent.

There are undoubtedly other examples of the use of the seismic method to provide data for the study of certain phases of stratigraphic-trap location. Many empirical attempts at record character study for stratigraphic trap guidance have also been made. None have been successful enough to have attracted much attention from the industry.

New Seismic Tools

Within the last several years, the geophysicists have added to their already elaborate tool kit two or more powerful instrumentations which have contributed immeasurably to the proper understanding of the seismic-reflection method. They promise also, with study, experimentation, and proper procedures, to make the routine discovery of certain types of stratigraphic traps a real possibility.

Continuous velocity log . . . The first and most important one is the continuous velocity log and its derived synthetic-reflection record. The continuous velocity log provides accurate data of the seismic velocities of the formations and the arrangement of such velocities in the geologic column. By use of the simplified reflection coefficient formula:

$$R = \frac{d_2V_2 - d_1V_1}{d_2V_2 + d_1V_1}$$

where d is density, V is the longitudinal velocity (the parameter measured by the continuous velocity logger), and the subscript 1 the upper layer and the subscript 2 the lower layer, the ratio of the amplitude of the reflected energy to the amplitude of the incident wave can be determined.

This amplitude coefficient will always be less than one, and if positive, represents that an incident compressional pulse will be returned as a compressional pulse; and if negative, that an incident compressional pulse will be returned as a rarefaction pulse. The density factor can become important in determining both the amount and sign of the coefficient if a layer such as salt is encountered, which has a relatively low density with a high velocity of transmission of seismic waves. Nevertheless, in a normal shale, sandstone, limestone sequence, the density factor can be neglected, since the normal effect of the density factor is to change only slightly the value of the coefficient but never to change its sign. It is, therefore, entirely realistic to eliminate the density factor and utilize only $(V_2 - V_1)/(V_2 + V_1)$ for the reflection coefficient. This can be further simplified, for convenience in handling, to the logarithm of the velocity.

Reflection coefficient log . . . Utilizing the simplified reflection coefficient formula, a complete continuous velocity log can be easily converted to a reflection coefficient log. Such a log of an Oklahoma well appears in Fig. 1. Each white indentation on the black strip indicates a place in the geologic section from which energy should be reflected, positive from the top of the white excursion and negative from the bottom. The depth of the excursion indicates relatively the amplitude of the reflected wave. It is immediately evident that the large indentation at 1.0 second, which represents the Hunton limestone, would reflect by far the most energy. This is, of course, borne out by the fact that the Hunton limestone where present in Oklahoma is by far the best reflecting horizon.

The serrated appearance of the log indicates that there are many reflecting horizons from the sequence of limestones, sandstones, and shales—as many as there are stratigraphic variations of formations. Such information is, therefore, present in our seismic records in complex form. In the past we have been accustomed to thinking of a few prominent reflecting horizons plus intervening noise as the content of the reflection record. It is apparent, however, that energy from each variation in the stratigraphic section is reflected to the surface and recorded on the seismic reflection record. This energy could be available for stratigraphic study if means for unscrambling this complex of data became available. We now have some means for approaching this unscrambling process.

Synthetic reflection record . . . By passing the reflection coefficient log on film through suitable reproducing apparatus, including a photoelectric scanning device, a filter simulating near-surface low-frequency ground conditions, an electrical network

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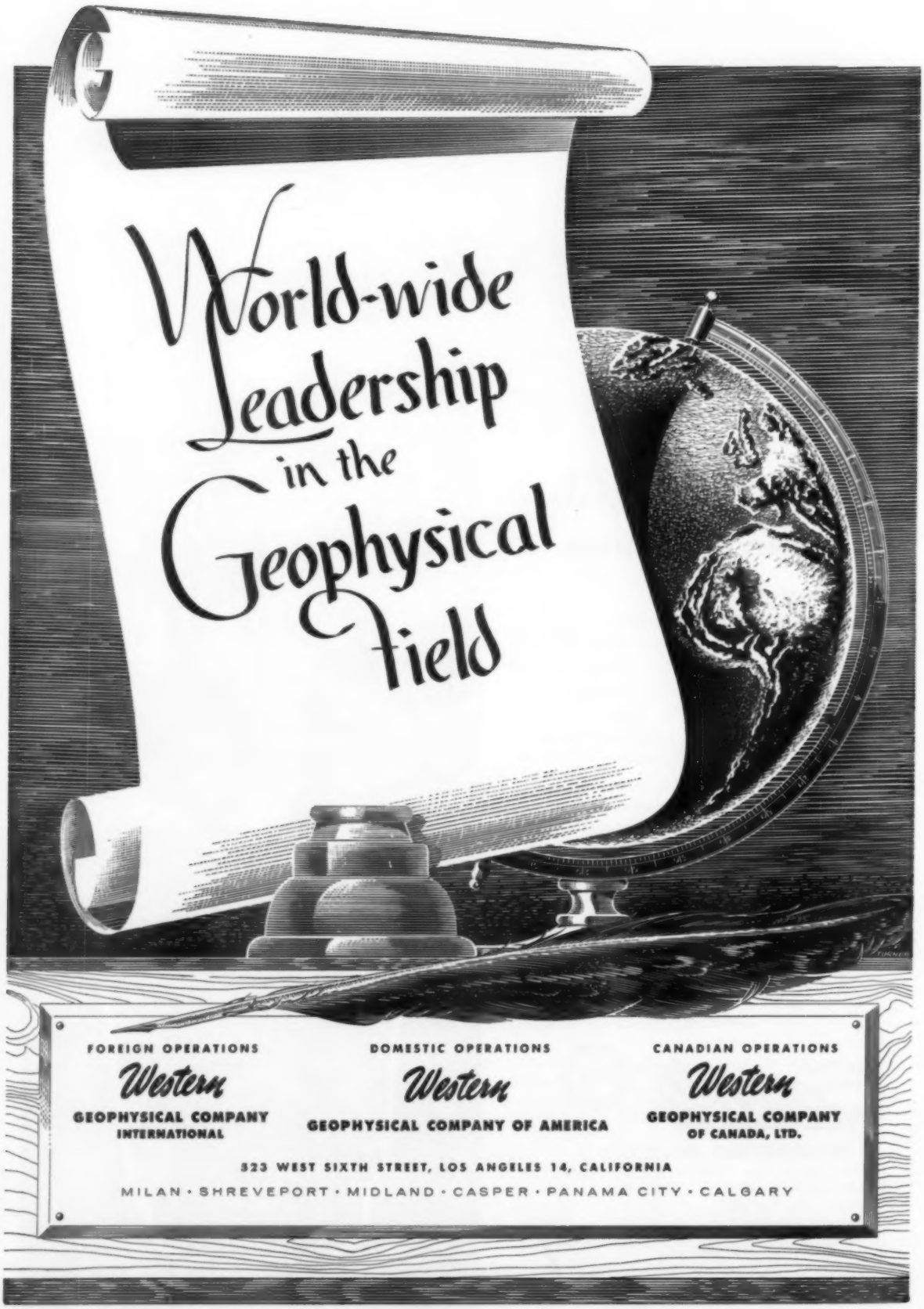
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equivalent to a geophone, and finally through normal seismic amplifiers and filters, we can obtain a synthetic reflection record.[4]

This record can serve as a standard of what should be obtained under ideal conditions from a reflection spread shot over such subsurface stratigraphy. Fig. 2 shows a portion of the reflection coefficient log of Fig. 1, including the Mayes, Hunton, and Viola. This is shown enlarged with the lowest trace showing the output from the photoelectric scanner; the next higher trace portraying the output from the first trace energy after passing through the ground filter and equivalent geophone networks; and the three top traces the synthetic reflection record. In Fig. 3 we see the remarkable coincidence between the synthetic reflection trace and the trace of a seismic reflection record shot over the well in which the reflection coefficient log was made.

Mapping Strat Traps

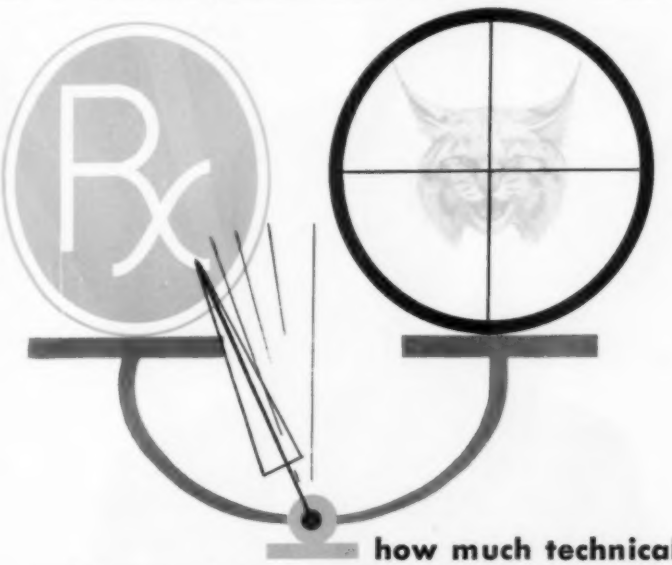
The use of the synthetic reflection record technique in the location of stratigraphic traps could be as follows: In the Julesburg basin of Colorado and Nebraska the commercial accumulation of oil in the D sand is usually provided by some structural closure plus the pinching out of the D sand. Many empirical attempts have been made to determine the presence or absence of the D sand from seismic records with little or no success. The efforts failed largely because the position of the character change on the record was not certainly known nor was the type of change known.

On the left side of Fig. 4 is a portion of a continuous velocity log taken in Colorado. The D sand is shown by the arrow. On the right side of Fig. 4, at the top, the scanning strip, or reflection coefficient log, with the D sand present is shown at the top of the synthetic reflection of this strip immediately below. The arrow on the reflection record points to the reflection character due to the D sand. Below is a reflection coefficient log but with the D sand removed and replaced by shale. The accompanying synthetic reflection record shows the character change caused by the absence of the D sand. The difference is obvious.

For the first time we now know where to look on the record and what to look for as a change in character due to the presence or absence of a reflecting sandstone. Practical geophysicists may object that in the field the recognition will not be so simple due to the varying surface conditions or other disturbing effects. This may be true, but in the early days of the reflection seismic method, correlations were made over wide areas on the basis of constant character of the reflection. Furthermore, if we could increase the frequency of the recorded reflection in the field, we can find more definitive character than that illustrated in the example.

Oklahoma possibilities . . . The D sand in Colorado is a good, although thin, reflecting bed with a reflection coefficient at its top of about one-half the coefficient of the usual Hunton limestone in Oklahoma. Most of the sandstones in Oklahoma which are known to be productive in stratigraphic traps have velocities varying from 13,000 to 16,000 ft. per second. These sands occur usually in a shale series with velocities below 11,000 ft. per second. The reflection coefficient on top of the Skinner sand in Oklahoma in many areas is almost as good as the D sand. The Oklahoma Burbank sand is perhaps a little better than half as good as the D sand, but should return enough energy to be recognizable on the reflection record.

We, therefore, should be able to determine from seismic records under good conditions whether or not such sands are present. The start is to secure



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continuous velocity logs from wells where the sand is present and productive and from a nearby well where such sand is absent. Synthetic reflection records should be made from these logs to determine the character of the reflection record where the sand is present and where absent, such as was done in the D sand illustration. The higher frequencies should be tried for best resolution. If recognizable character differences are present, an attempt should be made in the field to duplicate the synthetic record.

A relatively inexpensive program of experimentation in the laboratory and in the field should determine the possibilities of the chosen area. In many areas the presence of the sand means an oil field. In addition, as a byproduct of the field work, a normal structural map can be obtained at the same time. Furthermore, with the new techniques of examining old records, it is quite probable that once a reflection character has been recognized, some of the old records may be used to determine the presence or absence of certain sands in the section.

New cross-sections valuable . . . The new variable-density cross-section portrayal of seismic data,[5] which suggests by its paralleling bands of data a geologic cross-section, also indicates the actual reception by the seismograph of low-amplitude reflections from all stratigraphic boundaries. That such low-amplitude data should be reflected has already been made apparent by the reflection coefficient log already noted. It is probable that in our study of conventional seismograms the high-amplitude reflections have been used and the low-amplitude data neglected.

Pinchout over a known structure . . . In Fig. 5 a portion of a variable-density cross-section made over a slight anticline in Mississippian and older rocks near Guthrie, Okla., shows a bed pinching out on each side of the field. This would be expected from a structural picture of this type. The pinchout on each side is indicated by arrows. This change, so like a true geologic section, may be partly due to a thinning over the top of this small structure or to a replacement of the sandstone, which it may be, by a shale. In any event, Fig. 5 illustrates the detail available on variable density cross-sections. Such detail is not readily apparent on the standard trace cross-sections.

A comparison of such a cross-section with a known condition of this type, where well control is available, would soon determine whether data

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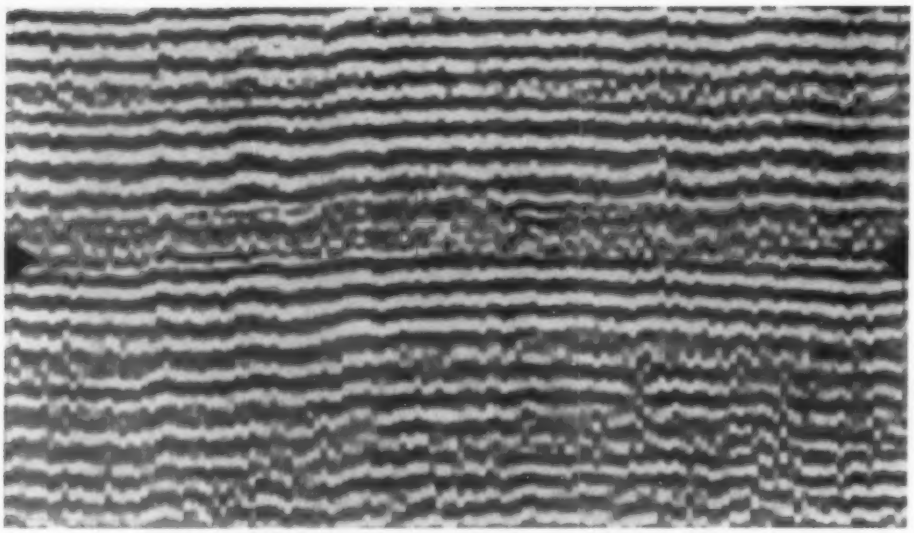

ARROWED reflection, possibly the Skinner sand, pinches out over this known oil field. Strat traps like this are obvious on this variable-density cross-section. Fig. 5.

of this nature could be used to determine possible stratigraphic pinchout in productive sands on similar structures in the area. It is possible that in this illustration the sand pinching out over the top of the structure may be the Skinner sand.

World-wide application . . . By proper use of the methods briefly described above, it appears very possible that stratigraphic-trap fields may be directly located by the seismograph. In some areas the discovery of the sand means an oil field. In others, certain structural conditions may be required in addition to the stratigraphic trap characteristic. It is certain that, despite the fact that many areas have been covered by the reflection seismograph in the search for structure, in these same areas where all structures have now been found and tested there still may exist stratigraphic traps of enormous value. These new oil fields may be located either by the application of new seismic field studies or also by the reexamination with modern techniques of old seismic records.

While the illustrations used in this paper have been from Colorado or Oklahoma, the methods suggested have world-wide application. Most productive sandstones have velocities higher than the surrounding shale. The greater the contrast between the velocity of the sand and the velocity of the shale, the better the chance for success. Fortunately, the possibilities of this method can be tested by a comparatively small expenditure of money. The results could be extraordinarily good.

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THE PROCEEDINGS OF THE GEOPHYSICAL SOCIETY OF TULSA. Tenth anniversary number, Vol. 4. Published by the Geophysical Society of Tulsa. 128 pp.

The proceedings contain several valuable papers that will appeal to both the practicing geophysicist and the research scientist. Two geophysical case histories are included as well as a paper on successful field techniques in the Delaware basin of West Texas. In addition to the longer papers, several short abstracts are included covering the various talks presented to the society during the year.

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GEOLOGY OF EVANGELINE AND ST. LANDRY PARISHES, Geological Bulletin 31. Published by Louisiana Geological Survey, P. O. Box 8847, University Station, Baton Rouge 3, La. $1.

The area covered by this bulletin is in the trend of prolific oil and gas production from sediments of Tertiary age. It contains the results of a comprehensive study of the subsurface geology of the two parishes and a section on the economic geology of the area. This includes petroleum geology, surface water, ground water, sand and gravel deposits.

Of particular interest is the petroleum-geology section which has a large amount of information on the producing sands including structure maps contoured on the top of the first Marginulina sand, base of Moodys Branch marl, top of Basal Cook Mountain marl and top of the Wilcox. A composite electric log of the two parishes is presented which shows the stratigraphic sequence and typical development of producing zones.

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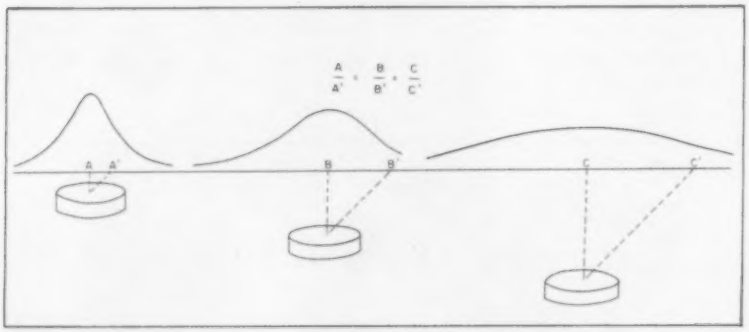
Discontinuity—Key word in oil finding

Density discontinuities and the associated effects on the gravitational field are the clues to the recognition and understanding of gravity anomalies.

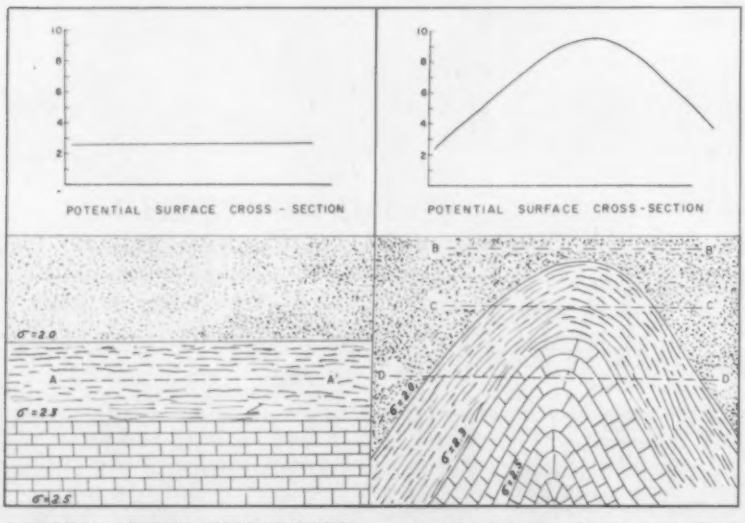
BY JONATHAN W. PHILLIPS
Geophysical Consultant, Neese Exploration Co., Houston

BASICALLY the requirements for a hydrocarbon trap is an arrangement of porosity and permeability discontinuities which obstruct the migration of the fluid within the reservoir rock. Discontinuities usually occur along the vertical dimension at the boundaries of the layered sediments. In the horizontal plane they occur in many ways —at the limit of structural closure, against a fault face or perhaps at a boundary of lithological change within the reservoir itself. These discontinuities may be observed and measured directly when they occur on the surface, but when they are buried by many feet of sediments their observation and measurement are always by indirect means.

By directly measuring the electrical potential between electrodes traversing a conductive mud column through the strata, electrical logging devices indirectly measure vertical discontinuities in the dielectric properties of the sediments. Other types of logging devices measure similar discontinuities in other physical properties of the sediments. These tools have the lowest resolving power of any geophysical instrument, since their radius of effective measurement is only several feet; however, high resolution of obtained data is permitted by the expedient of direct contact with the strata being mapped.



HERE WE SEE the "cosine effect." Notice that the shallow disk has the sharpest anomaly; the deepest disk has a flatter anomaly but affects a greater area horizontally. Fig. 1.



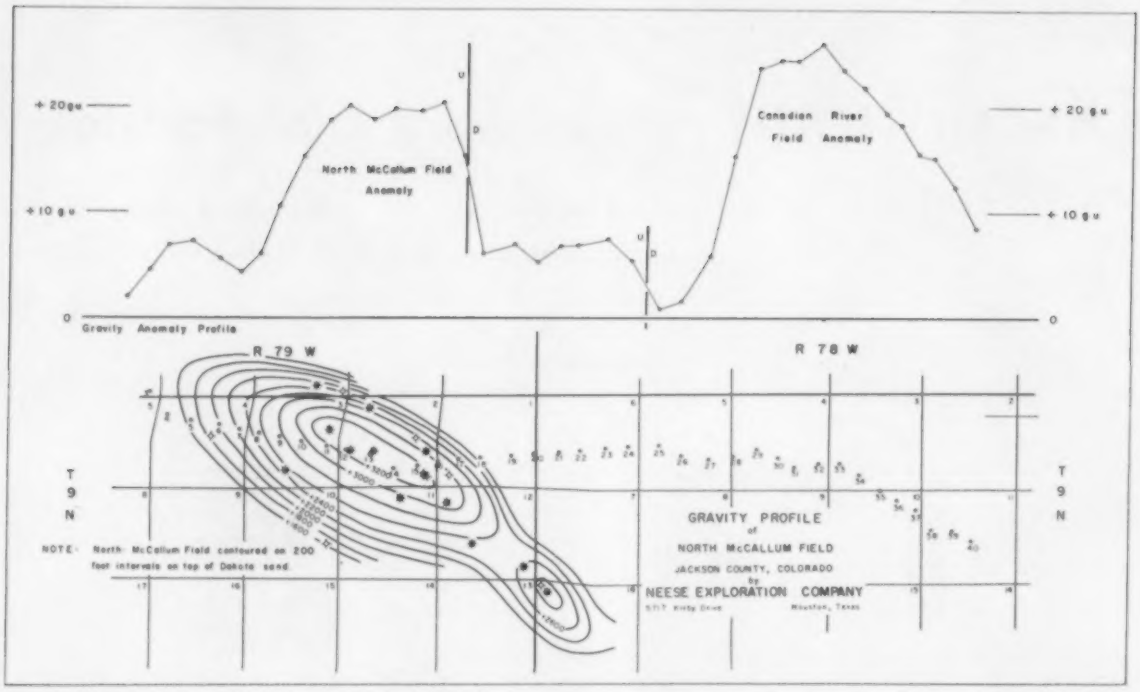
ALTHOUGH DENSITY DISCONTINUITIES exist in the left figure, no anomaly is mapped and the potential surface is flat (upper left). Uplift, however, disturbs the density arrangement and causes an anomaly (upper right). Fig. 2.

Geophysical methods . . . The seismograph, which has the highest resolving power of any geophysical instrument yet devised, measures round trip travel times of sound waves which move with varying velocities through strata of differing elastic properties. The waves are reflected by any boundary at which there is a change in elastic properties causing a velocity discontinuity in either the vertical or horizontal dimensions.

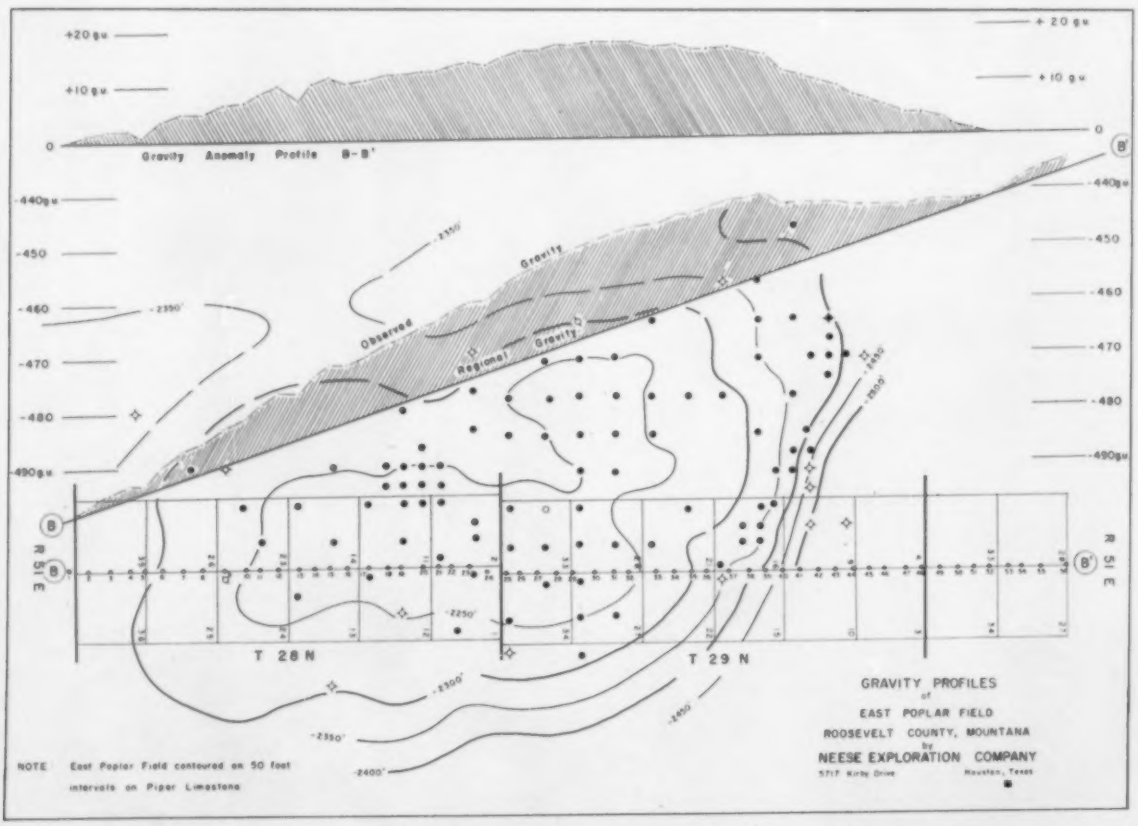
- Magnetic methods measure the distortion of the magnetic field at the earth's surface caused by horizontal discontinuities in the magnetic properties of the basement complex.

- Gravity methods measure the distortion of the gravitational field at the earth's surface caused by horizontal discontinuities in the density of the underlying rocks.

Both gravity and magnetic measuring devices are medium resolution instruments. Although they are sensitive to discontinuities buried thousands of feet under sediments, the magnitude of the measured effects in uncurved


+ 20gu
+ 10 g.u
0
North McCallum Field Anomaly
Canadian River Field Anomaly
Gravity Anomaly Profile
R 79 W
R 78 W
T 9 N
NOTE- North McCallum Field contoured on 200 foot intervals on top of Dakota sand
GRAVITY PROFILE of NORTH McCALLUM FIELD JACKSON COUNTY, COLORADO by NEESE EXPLORATION COMPANY

THE TWO ANOMALIES reflect North McCallum on the left and Canadian River on the east. Two faults are also evident. Close control is essential to obtain this quality data. Fig. 3.



GRAVITY PROFILES pick up the East Poplar structure, an asymmetrical producing anticline in Montana. Regional positive gradient probably reflects the basement. Fig. 4.

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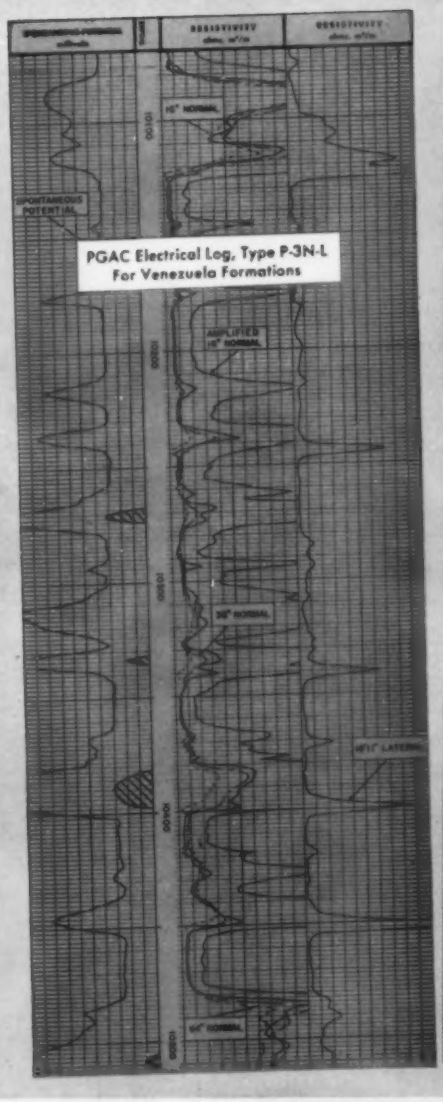

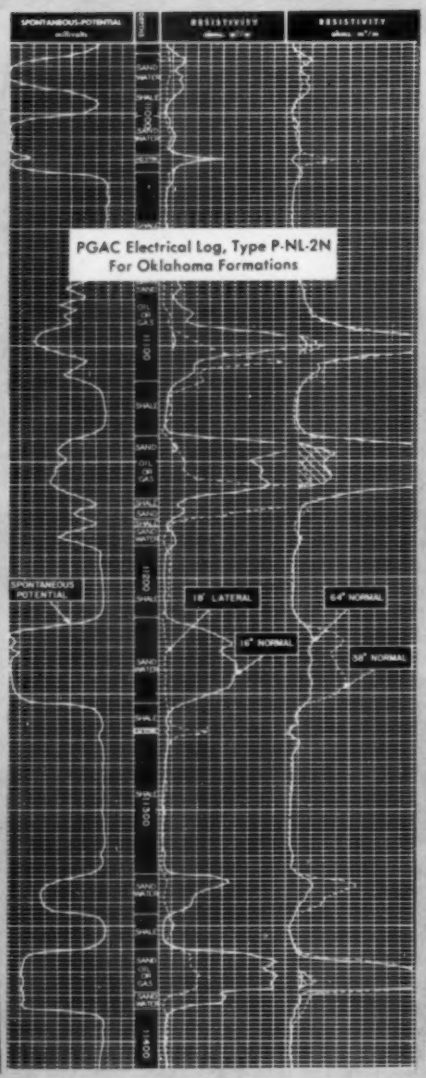

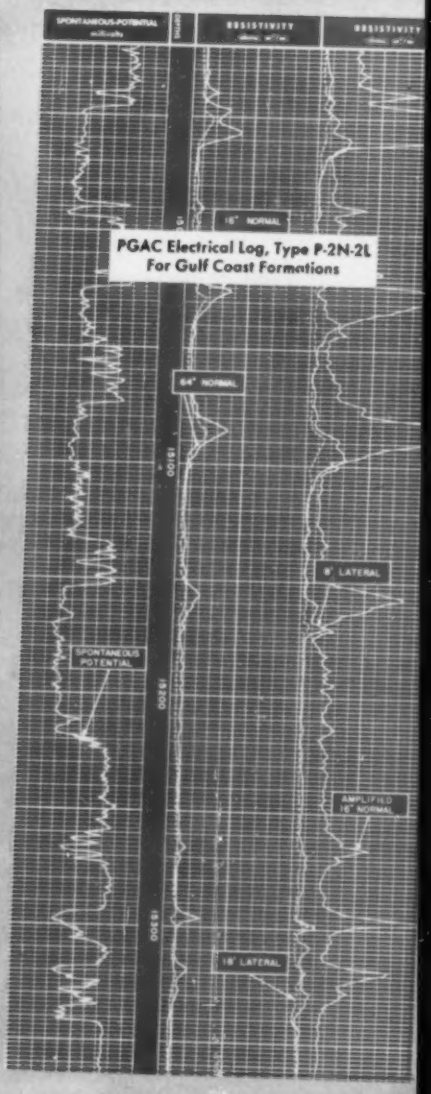

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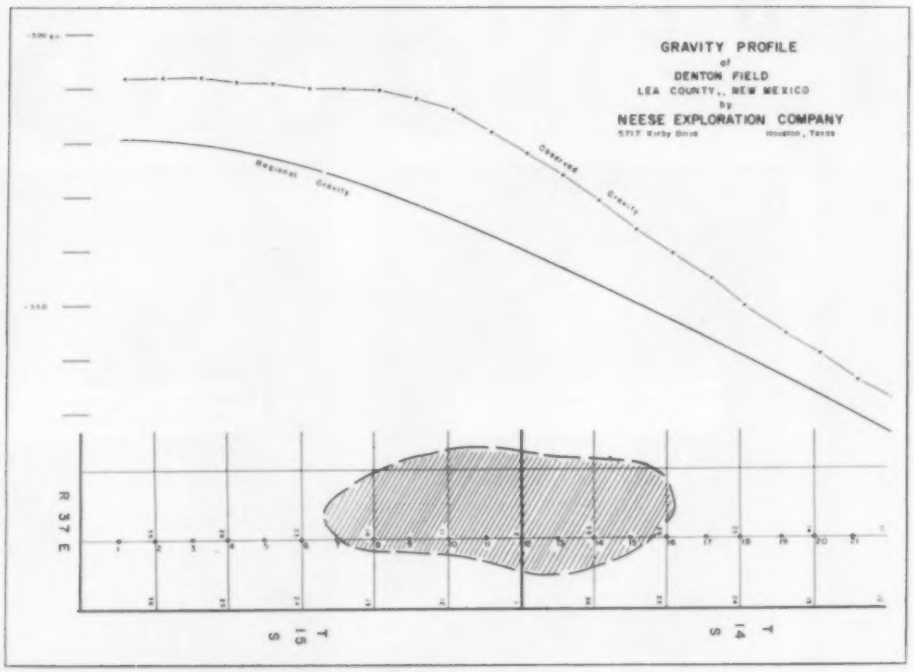
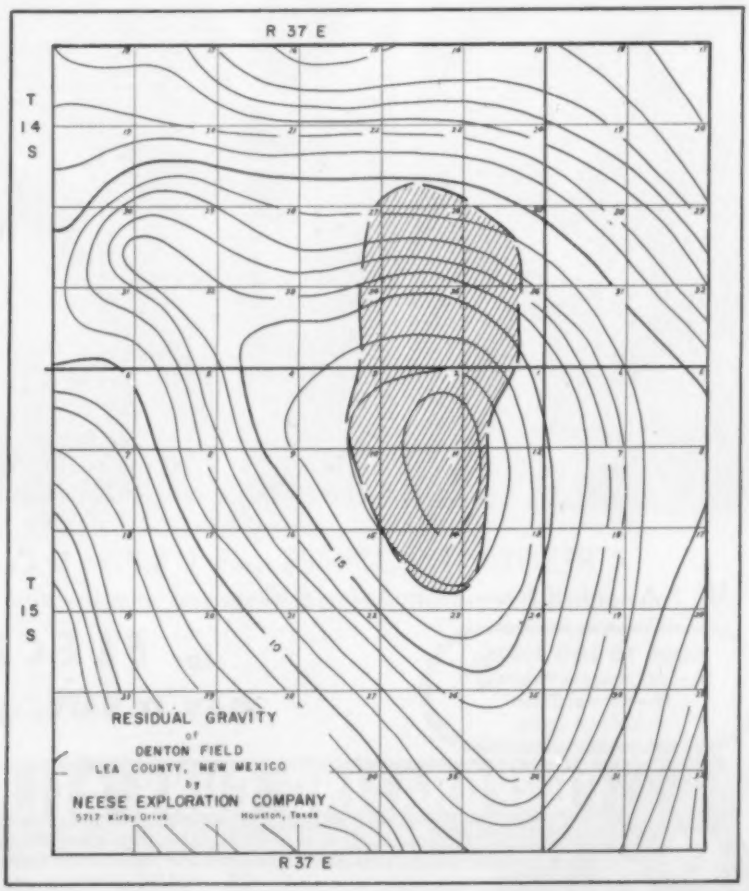


DENTON FIELD in Lea County, New Mexico, is mapped on the gravity profile as an anomaly with greater values than normal regional would indicate. Fig. 5.

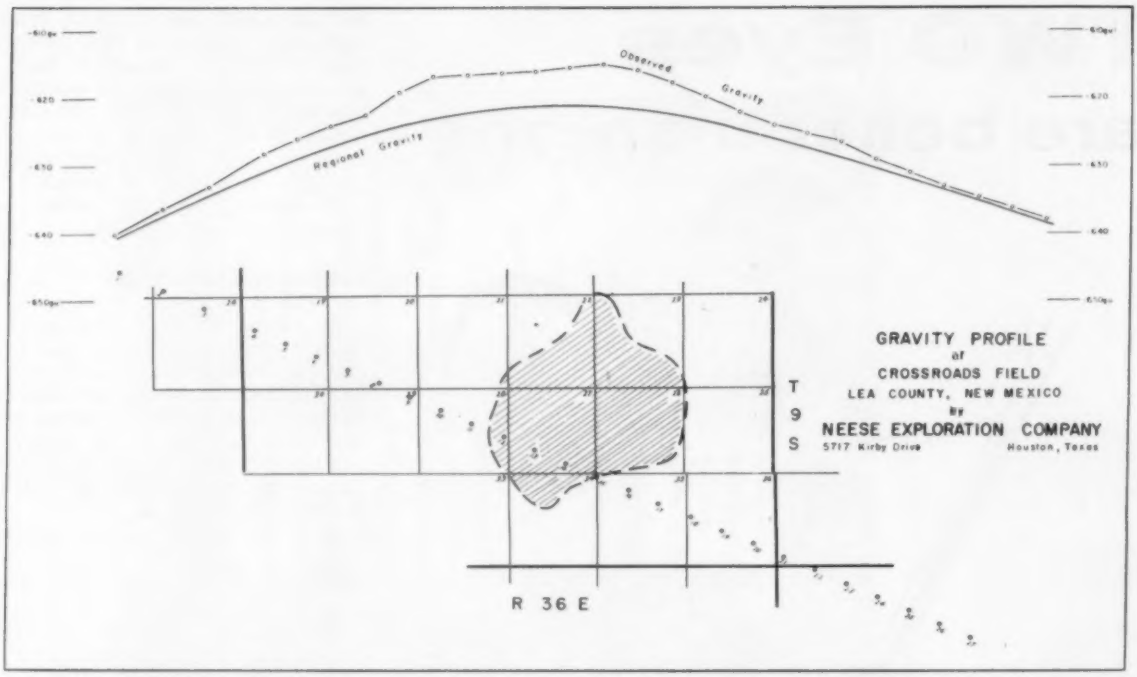
three-dimensional space varies inversely with the square of the distance from the source to the measuring device. We are indeed fortunate that nature has bestowed this integral power, simplifying what would otherwise be involved mathematical computations. Since gravity and magnetic measuring devices traverse the horizontal surface instead of the vertical extent of the sediments through a well bore, the resolution of the obtained data is low for deep sources and becomes greater as the source becomes shallower.

An additional diminution of measured gravity effects is caused by the presence of the high magnitude, total gravitational field of the earth. Due to its influence only the vertical component of the effects of discontinuities are measured by the gravity meter. Fortunately, this situation actually increases the resolving power of the data since it is most sensitive to sources directly beneath the instrument and diminishes proportionally as the cosine of the angle between the vertical and the line connecting the source and the instrument.

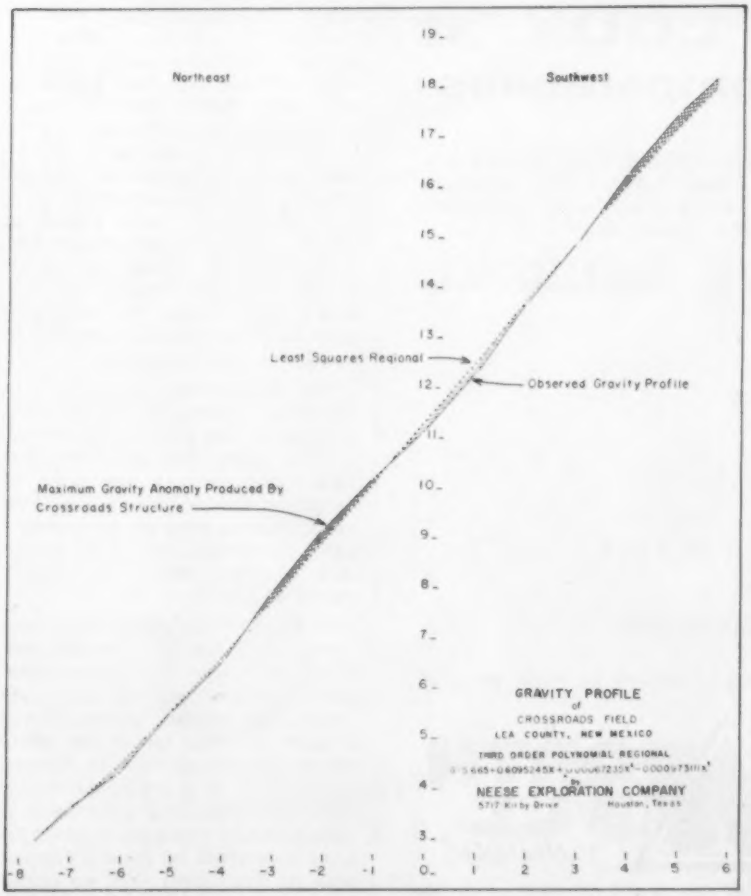
Theoretical example . . . Fig. 1 is an example of one aspect of the cosine effect. Three disks of identical mass and volume are buried and the observed gravity effect at the surface is plotted for each one. Disk A is buried at the shallowest depth and displays the greatest magnitude of effect over the center. The magnitude drops



DENTON APPEARS on this "profile anomaly map" as a positive feature. The small anomaly to the northwest may be due to a near surface disturbance. Fig. 6.



CROSSROADS, also in New Mexico, lies on the northern flank of a large regional gravity maximum. Fig. 7.



METHOD OF LEAST SQUARES tends to dampen the magnitude of the anomalies and give a qualitative confirmation of the Crossroads lead. Fig. 8.

rapidly as the meter moves away from the center. This is because of a rapid cosine foreshortening of the vertical component, due to the large change of angle between vertical and the line connecting meter and disk axis, as the meter moves a short horizontal distance. Disk B is buried a little deeper and the magnitude of effect over the center is less than that at A. The radial change in magnitude is not as rapid since the change of vertical angle is smaller for like horizontal distances moved. Finally, Disk B, buried the deepest, has the lowest magnitude over the center and the slowest horizontal rate of change.

For a constant vertical angle between meter and mass center, the ratio of the central magnitude to that measured at the surface intercept is constant for any depth of burial. This is illustrated by the equation where the letters represent the measured magnitude at each point.

Naturally, the mass discontinuities associated with geological structure are not distributed in geometrically simple shapes such as the illustrated disks.

Inverse square and cosine effects . . . The essential ingredient in gravity analysis is the understanding of the combination of the inverse square and cosine effects on the measured gravitational field of irregularly shaped density discontinuities. Unfamiliarity with the qualitative and quantitative aspects of these phenomena weakens

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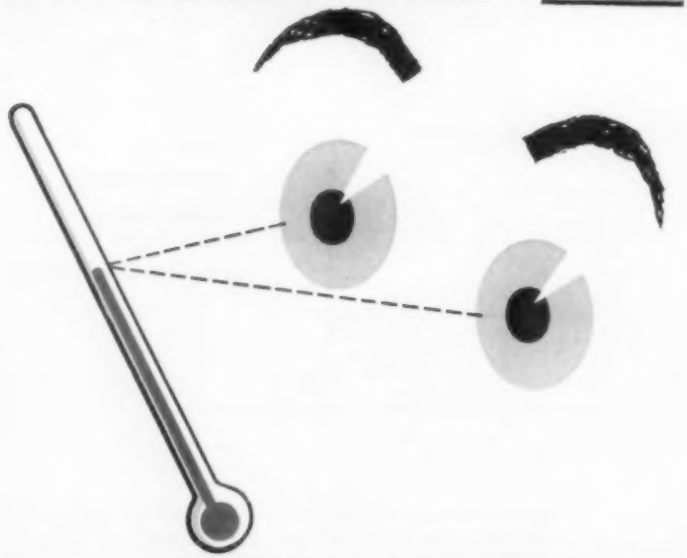

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the interpreter's perception of true anomalous features on the gravity map. Although a theoretical background is essential, it is obvious that this understanding increases with each experience of observation of the effects of known density distribution. For this reason the experienced interpreter displays an insight which can be obtained in no other way.

Early successes unfortunate . . . Since the first gravity survey was undertaken by Humble Oil & Refining Co. in 1930, this technique has had its most phenomenal success in the location and delineation of salt domes, those tremendous buried mountains of salt whose very growth and development is dependent on the mass deficiency which renders them detectable by the gravity meter.

In a way this success was unfortunate, for in the thirties, when the gravity meter was in its embryonic stage, the surveys outlined for its use were designed primarily for the detection of these domes. Only a very loose network of station locations was necessary to record their widespread effect. Very large areas could be blanketed by such control at a very nominal cost. Subsequently, gravitational methods have been applied to sedimentary basins where structural deformations and stratigraphic permutations involve a more subtle density distribution than the contrast between salt and sediments and where these configurations are more limited in vertical extent than the domes. The gravity effects present are much smaller in magnitude and areal extent than domal influence, yet surveys outlined for their detection continue to manifest salt-dome control.

This misapplication combined with negligible interpretive analysis has often given such poor results that the method rather than its misuse has been questioned. In the hope of mitigating this attitude, a simplified explanation of some of the problems and proposed solutions in the pursuit of more refined surveys and analyses should be attempted.

In the procedure of explaining gravity to the layman it is probably best to rely as little as possible on mathematical terminology. In gravity the integral sign is almost a cliche, as well it might be, since one of the inventors of integral calculus was Newton, the founder of gravitational theory. Although mathematical abbreviation is appreciated by physicists, it has a demoralizing effect on those unfamiliar with its applications. Yet we cannot ignore the adaptability of mathematical tools to potential field problems,

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so a brief description of these techniques is sometimes necessary.

Bouguer maps . . . The map to be analyzed by the geophysicist is termed a Bouguer map, after a French geodesist of the eighteenth century. Measurements have been corrected in the field for instrument drift due to tidal effects and mechanical strain. Station values have been further corrected in a central computing office for the distorting influences of latitude effects due to the earth's spheroidal shape and centrifugal variations at different distances from its axis of rotation. A twofold elevation influence has also been removed and, where necessary, terrain effects have been accounted for.

In spite of all these corrections there still remain some distorting influences which mask many of the true anomalous features. Nevertheless, the Bouguer map represents the deviation of the vertical component of field strength of any point on the map datum from absolute gravity, subject to the above corrections.

Neglecting the corrections it shows the gravitational potential field over that portion of the earth's surface covered by the survey. Physically the contour lines represent the intersection of equipotential surfaces with the map datum. The potential field is still influenced, not only by the density discontinuities of the structures being sought, but by broad regional effects due to igneous basement configuration and by horizontal density changes due to lithological and thickness variations in the sediments.

Effect of uplifts . . . Having recognized these distorting influences, we are in a position to remove them from consideration and resolve the anomalous density discontinuities coinciding with the porosity and permeability discontinuities which form a hydrocarbon trap. As an example of the effects of anomalous horizontal density discontinuities in structure let us examine Fig. 2. On the left is shown a sequence of layered sediments which increase in density with depth. This increase is in discontinuous steps at the vertical boundaries of each layer. Along the horizontal line A-A′ there is no change in density. This would be true along any other horizontal line in the sequence and this constant density distribution in the horizontal is reflected in the observed potential surface as a constant field strength 2.5 milligals above the reference zero potential.

On the right, this same sequence of sediments is shown uplifted into structure. Along the line B-B′ there is no density change. Along the C-C′ the density changes from 2.0 in the sand to 2.3 in the shale and back to 2.0 g. per cc. in the sand. This horizontal change from low to high to low density is referred to as a positive density contrast. An even greater positive contrast is noted along D-D′ The sum of the measured vertical component of the gravitational field due to each of these contrasts plots as a gravity maximum on the potential diagram. In actuality the measured potential field exhibits the summation of the effects of density contrasts along all horizontal planes through the sediments and below, restricted only by the inverse square and cosine effects mentioned previously.

NORTH McCALLUM FIELD

We are already familiar with how such a structural uplift can form porosity discontinuities which trap petroleum. Now let us examine an actual example of how such a trap is detected by the gravity meter in the field. Fig. 3 shows a profile of gravity stations run over North McCallum field in the North Park basin of Jackson County, Colorado. This basin is one of a chain of intermontane

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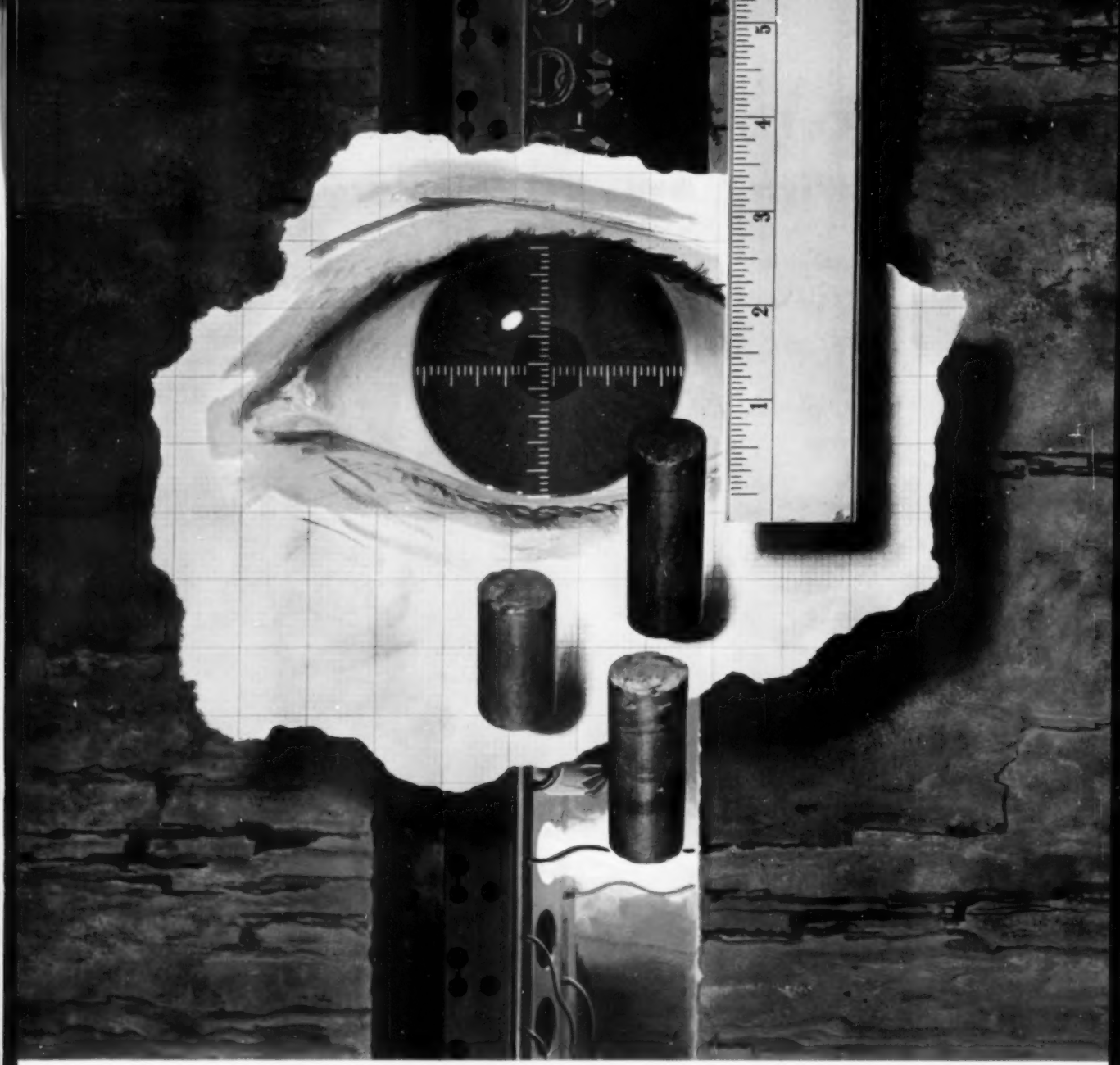

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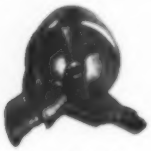

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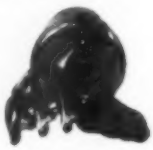

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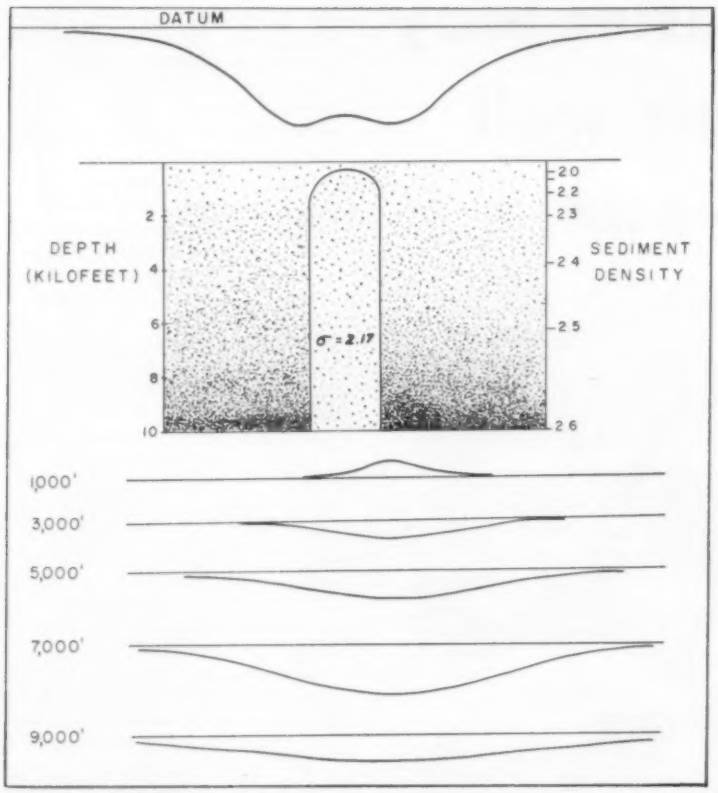

TYPICAL SALT DOME with a density distribution as shown. Notice that the shallow anomaly at 1,000 ft. is positive, due to the influence of the cap rock. Fig. 9.

basins lying between the Front and Park ranges of the Rocky Mountains.

The Medicine Bow Mountains of the Front Range lie only a few miles to the east of the North McCallum anticline and compression from this direction has caused sharp folding and faulting of the sediments along the eastern flank of the basin. The sharpness of the folding at North McCallum is shown by the contours on the Dakota sand of the Lower Cretaceous Cloverly group. It is at this zone that a density contrast is expected between the underlying predominately sandy section of the Lower Cretaceous, Jurassic, and Triassic systems and the overlying shales of the Upper Cretaceous and Tertiary systems. Another contrast is undoubtedly present at the contact of the sediments with the igneous basement.

The broken profile running diagonally across the figure was constructed by plotting the field strength measured at each numbered station against its horizontal position projected onto an east-west line. The vertical scale shown on either side is graduated into intervals of 10 gravity units. One gravity unit, of course, is equivalent to a field strength of one ten thousandth of a dyne per gram of mass. The profile had to be run in a broken line because of inaccessibility due to snow so that a gradient change is apparent at each change of direction, lending a jagged appearance to the profile. Nevertheless, the qualitative analysis of the data is readily apparent.

Basement effect . . . The steady increase in field strength from west to east is undoubtedly due to the basement contrast which culminates in the basement outcropping in the Medicine Bow Mountains to the east. This regional increase is indicated by

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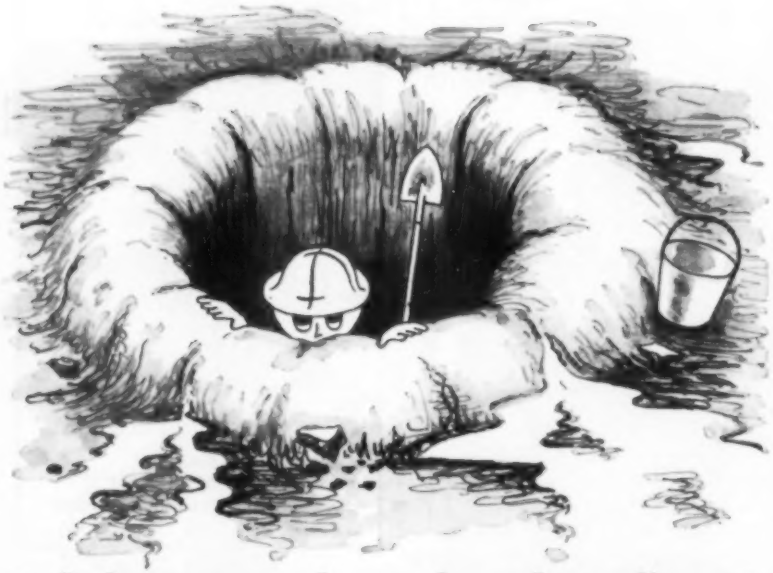

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the smooth curve labeled "Regional Gravity" directly beneath the observed curve. It was thought unnecessary for illustrative purposes to account for gradient changes which would be present due to directional changes in the profile.

The regional scalar value of each station was subtracted from its observed value and the difference plotted as the gravity anomaly profile shown at the top. The two resolved maximum anomalies show the gravity effects of the producing fields of North McCallum on the western end and Canadian River on the east. Two faults are indicated. One is the thrust fault on the northeast flank of North McCallum and another is in a zone between Canadian and North McCallum. Both are evidenced by the abnormally steep gradients indicative of a sharp density discontinuity.

It is easy to see that the quarter-mile station control was necessary, not only to detect the faulting but to define the anomalies with any suitable degree of accuracy. The anomalies would still be present if only every other station were plotted but the resolution is increased and the statistical error reduced by the close control.

The faulting would be even better defined and substantiated by 500-ft. station intervals. Close control, obtained on the initial survey, costs much less than addition of control by a later survey. The optimum survey which would combine fair resolution with economy would have half-mile loops of quarter-mile stations at the basin fringes and 1-mile loops of half-mile stations at the center where the contrast is deeper.

MONTANA EXAMPLE

Another good field example is illustrated in Fig. 4. This shows two field profiles over East Poplar field in Montana. You will note the less jagged appearance of the plotted station values since the stations were run in straight lines. The interpreter must always keep in mind that where a regional gradient is present a change of direction in the profile will change the gradient of the observed gravity. East Poplar field lies on the west side of the Williston basin, which is a large interior depositional basin.

Due to the predominance of drilling on the western side, the majority of the known structures lie in this area. One of the largest is the Cedar Creek anticline, only 60 miles south of Poplar, whose axis is aligned in a northwest-southeast direction. A similar alignment is detected in the Poplar anticline, indicating a probable common orogenic inception.

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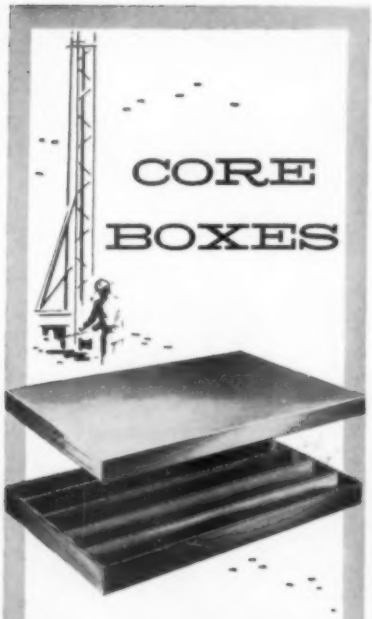

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Factors affecting anomaly . . . The major density contrast would probably be at the post-Mississippian unconformity where underlying limes and evaporites grade into overlying red beds and shales. The basement contrast is detected as a regional positive gradient to the northeast as it becomes shallow toward the Bowdoin dome. The magnitude of the positive contrast is augmented half a milligal by the truncation of about 200 ft. of salt in the upper Charles.

At a depth of 5,500 ft., assuming a contrast of 0.2 the additional five gravity units would increase at the point of truncation with a gradient of one gravity unit every 3,000 ft. Such a gradual increase would be difficult to resolve, even with close station spacing.

The short limb of the asymmetric fold is detected on the north and east ends of the two profiles as a steep local gradient indicating an abrupt density discontinuity suggestive of faulting. A line connecting the points of steepest gradient on each profile is parallel to the extrapolated contours on the Piper lime.

Although the construction of the regional curves appears arbitrary, there are two criteria applied. One is that the curve must be a smooth, low-order curve with no abrupt changes in gradient. The other is that the scalar value of points at profile intersections must be the same. If these conditions are fulfilled a network of profiles contoured on their regional curves will represent the low order curved potential surface resulting from regional influences on the gravitational field. The greater the quantity of surrounding data, the larger the number of intersecting profiles possible, and the higher the quality of the regional curve construction.

NEW MEXICO RESULTS

Denton field . . . Generally, this "crosstying" of profiles produces regional curves which would be constructed differently on isolated profiles. An example of this is shown in Fig. 5, a profile across Denton field, Lea County, New Mexico. This field lies in the Permian basin, which is another interior basin. Here the regional curve appears to be "hanging in space" on the southern end of the profile, but it is firmly tied in to regionals on profiles of the intersecting section lines. If the profile illustrated were an isolated one, the chosen regional curve would dampen the magnitude and possibly shift the apex of the anomaly.

A contoured map of the gravity anomaly profiles over Denton field is shown in Fig. 6. To denote the similarity it is labeled a "Residual Gravity Map" in spite of the stigma attached to residuals because of the distorting effects of the templates used in the usual construction. Possibly "Profile Anomaly Map" would be a less stigmatized euphemism.

Deep density contrasts are positive at the basement contact and positive at the contact of the Silurian-Devonian dolomites with the overlying Mississippian and Pennsylvanian limes and Permian limes and sands. A shallow contrast is positive at the contact of the alternating sands and anhydrites of the Capitan series with the Salado salt and overlying red beds.

The Denton anomaly has a magnitude of about 18 gravity units which is probably due to the summation of the effects of the deep and shallow contrasts. A narrow nosing of the contours to the northwest suggests an isolated shallow density discontinuity which might be structure in the shallow contrast.

Crossroads . . . North of Denton in northern Lea County lies Crossroads field. Fig. 7 shows a profile across its southwestern end. It lies on the northern flank of a large regional gravity maximum. The local anomalous deviation from the low order regional curvature is clearly shown on the profile to be about five gravity units. An abrupt gradient change whose inflection point is at Station 8 appears to define a fault which is downthrown on the west.

Detection of such low magnitude anomalies may seem to be highly interpretive and a confirming detection by unbiased methods has a basic appeal.

Confirming the anomaly . . . By equating the regional field strength to a polynomial in the horizontal coordinate we can obtain an unbiased mathematical solution for our regional curve. This is done by the method of least squares. The method tends to dampen the magnitude of the anomalies since it will intercept equal areas on both positive and negative sides of the regional, but it is a good qualitative test.

Fig. 8 shows an example of such a computation on a northeast-southwest profile over Crossroads. Only a third-order curve was used since any higher order might have diminished the magnitude even more. Subtraction of about 0.3 from the constant term would shift the computed regional curve down to a very close agreement in magnitude with the biased regional.

The qualitative confirmation is apparent. The low order regional potential of the Permian basin with its

associated low-magitude anomalies is very well suited to this technique.

We have dwelt on the gravity effects of structures which have involved positive density contrasts. Where there is a negative contrast present, due to salt intrusion or truncation of a dense section such as in the Cambrian trend of the Bend arch in Central Texas, the techniques are the same except that the regional curve is plotted above the observed profile, emphasizing the minimum deviations.

SALT DOMES

No more simple example could be provided than by the perennial gravity favorite, the salt dome. Fig. 9 shows a hypothetical example. This dome protrudes through a sand-shale sequence typical of the Gulf Coast in which the sediments are compacted with depth. This compaction increases the density of the sediments while the density of the salt remains constant, although its state is somewhat plastic due to the high pressures. These density relations are indicated by the areal density of the dots and the density scale at the side.

Below the section are curves of typical computed gravity effects of disks of salt at the different indicated depths. At 1,000 ft. the salt is slightly denser than the sediments causing a positive contrast. The magnitude diminishes radially in a very short distance due to the cosine effect. On domes with dense cap rock the magnitude of the maximum is even greater. At 3,000 ft. the density contrast is negative but very small so that the central minimum magnitude is small. This effect dies out a little less rapidly away from center due to the lessened cosine effect at the deeper level.

At 5,000 ft. the central minimum magnitude has been increased by a greater negative contrast and decreased slightly by the inverse square law. The radial diminishment continues to spread. At 7,000 ft. the rate of magnitude increase begins to level as the sedimentary density approaches a constant. The rate of magnitude decrease due to the inverse square law begins to predominate. The cosine effect continues to spread the anomaly.

Finally at 9,000 ft. the inverse square law has begun to rapidly diminish the magnitude. The cosine effect has spread the anomaly so that it could be easily masked by the influence of a strong neighboring anomaly. The observed curve over the dome is a summation of all these effects.

Planning a gravity survey . . . Before exploration of an area is begun, it is best to estimate before-hand the type of density contrasts involved in the sedimentary section and the probable magnitude and areal extent of the expected anomalies. When possible, several profiles should be surveyed over known producing traps of the type being sought. This information will allow the gravity analyst to determine the optimum control for maximum quality of data at minimum expenditure of budget.

It is during such periods of low exploration budgets as the present recession that the farsighted company should be using the inexpensive methods to acquire data on possible future areas of interest. A storehouse of such information will be an invaluable aid in pinpointing the locations for use of the higher resolution but more expensive exploration tools at a later date. The value of a ready reference for short notice leasing plays is obvious.

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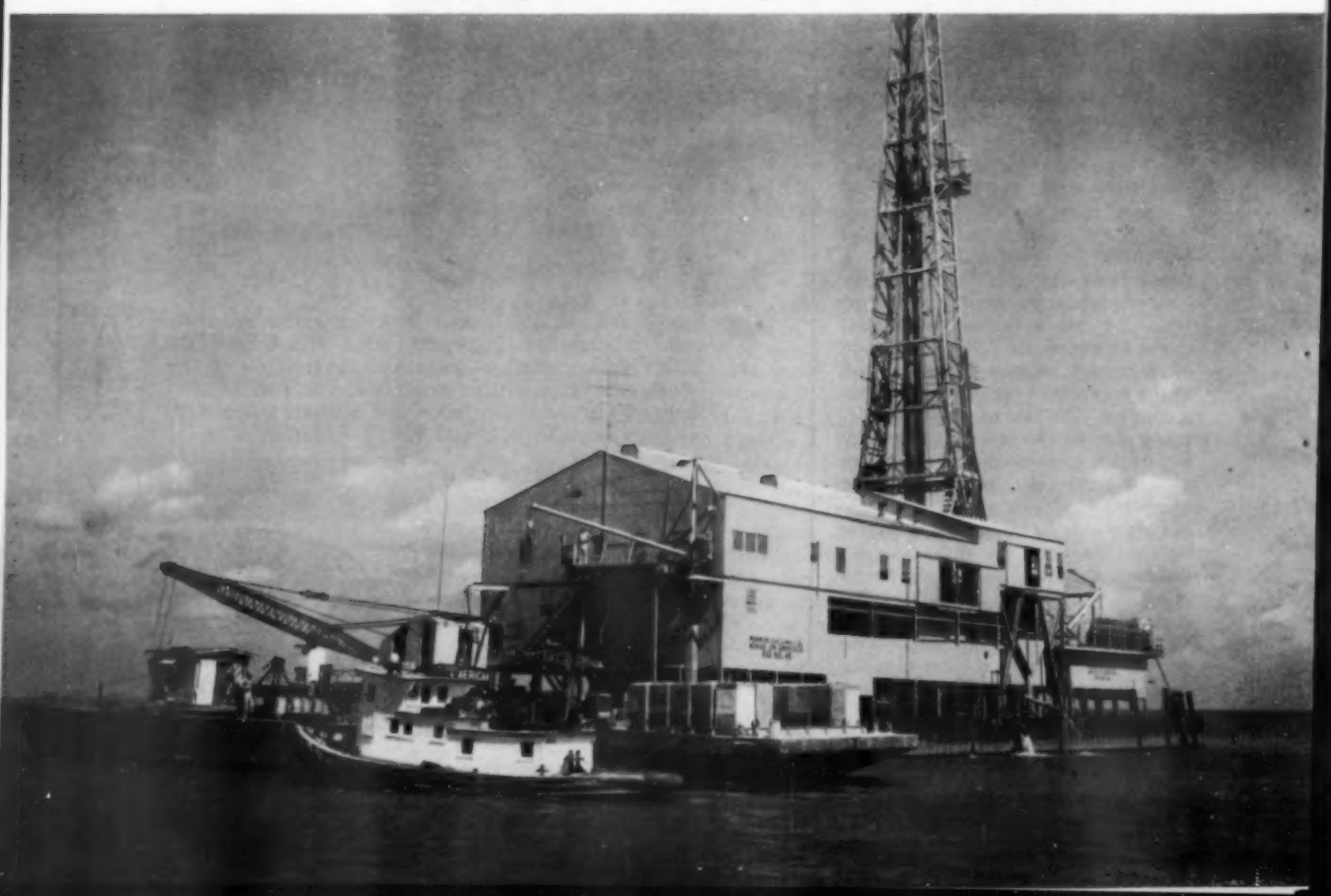

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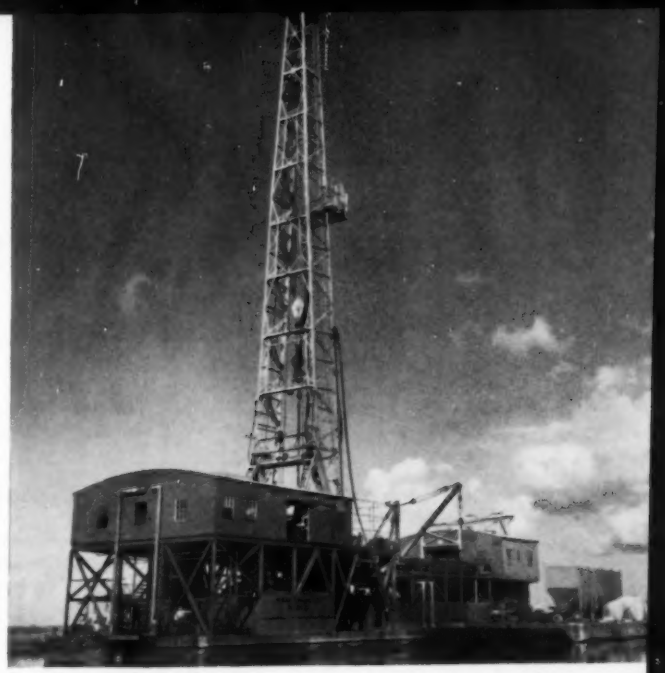

Penrod's Rig No. 41, drilling southeast of Port Sulphur, La., also is powered by Caterpillar. Two D397s are compounded to drive the drawworks, two additional D397s drive the mud pumps, two D315s drive Mission Water pumps, and a third D315 drives a Gardner-Denver water pump, with a Cat D315 Electric Set used for auxiliary power.

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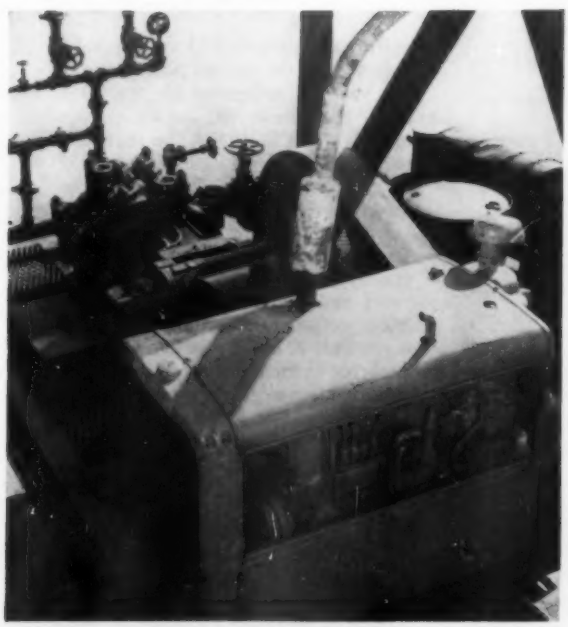
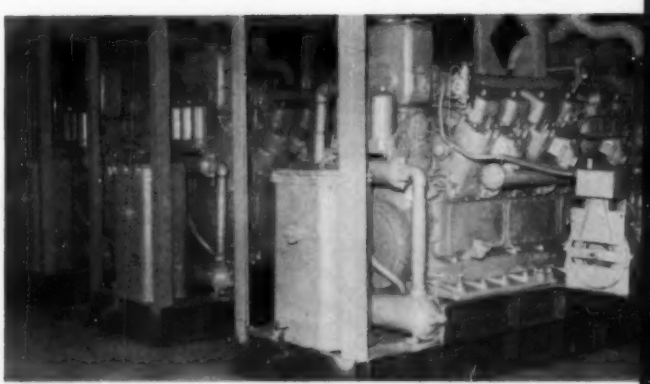


This Caterpillar D315 Engine drives a water pump on Penrod's Rig No. 41 near Port Sulphur, La. One of many components which make Cat Engines dependable is aluminum precision-type bearings supporting the crankshaft. Each bearing has a thin coating of tin for proper bearing break-in for long engine life.



These three Cat D397 Engines are compounded to drive the Emsco drawworks on Penrod's Rig No. 45. Three additional Cat Engines drive the mud pumps and two Caterpillar Diesel Electric Sets furnish auxiliary power for the rig.

Dept. OG3, Engine Division
CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.

Send me more information about Caterpillar Diesel Engines for prime and auxiliary power in drilling operations.

☐ I would like detailed information, as I may be in the market for a Cat Diesel Engine or Electric Set. I understand I am under no obligation.

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Seismic work hits a slump

Dropoff started in winter of '57, and got no better fast

BY HOMER G. PATRICK
Humble Oil & Refining Co.

GEOPHYSICAL PROSPECTING by the petroleum industry in the United States continued to decrease in 1957. Significant reductions occurred in the use of the seismic and gravity methods. There was an increase in the use of the magnetic method, but this method accounts for only a small portion of the total geophysical operations. Fig. 1 shows the monthly variations in seismograph and gravity crew-months in the United States since the year 1944.

Seismic activity declined during the winter months of 1957. Crew activity showed gains during spring and summer, and was reduced sharply in the late fall to a new low level for recent years. An average of 522 seismic crews operated in the United States during the year as compared to the 1956 average of 568 crews, and an average of 591 crews in 1955. The reduction in total seismic operations during 1957 as compared to the 1956 operations was 8 per cent.

This is an abridged version of the preliminary report of the committee on geophysical activity of the Society of Exploration Geophysicists, of which Homer G. Patrick is chairman. The full report will appear in Geophysics, official publication of SEG.

TABLE 1—GEOPHYSICAL CREW-MONTHS IN UNITED STATES—1957

	Seismic		Gravity		Magnetic		
	Company	Contract	Company	Contract	Company	Contract	Total
Texas	891	1,022	132	155	16		2,216
Louisiana	561	808	111	29		1	1,510
New Mexico	432	411	48	84	29		1,004
California	48	60	7	17			132
Wyoming	162	138	7	16			323
Colorado	90	114	2	45			251
Montana	115	141	16	18			290
Oregon			28				28
Utah	117	98	3	44		18	280
Oklahoma	177	149			11		337
North Dakota	24	42		3			69
Mississippi	120	237	16	41			414
Kansas	48	79	12				139
Others	49	138	4	32		1	224
Subtotal	2,834	3,437	386	484	56	20	7,217
Total	6,271		870		76		7,217

GEOPHYSICAL ACTIVITY in the United States declined during 1957. Seismic work was off 8 per cent from 1956; gravity work was down 12.7 per cent from the previous year. Fig. 1.

Gravity work . . . Explorations by the gravity method were reduced in February and March, and remained at a fairly constant level during the next 6 months. A decline in activity again occurred in the fall, reducing the number of active gravity crews in the United States at the end of the year to 66. At the beginning of the year 78 gravity crews were in operation. The average number of gravity crews in operation was 72 in 1957, 83 in 1956, and 90 in 1955. Total gravity work in the United States was 12.8 per cent less in 1957 than in 1956.

Magnetic surveys . . . Magnetic work increased from 45 crew-months in 1956 to 76 crew-months in 1957, an increase of 40.8 per cent. In addition, more extensive use of the airborne

SEISMOGRAPH ACTIVITY declined in Texas, Louisiana, and California, but all other areas registered gains. Fig. 2.

GRAVITY WORK in the United States was concentrated in the Rockies, Texas, and Louisiana. Fig. 3.

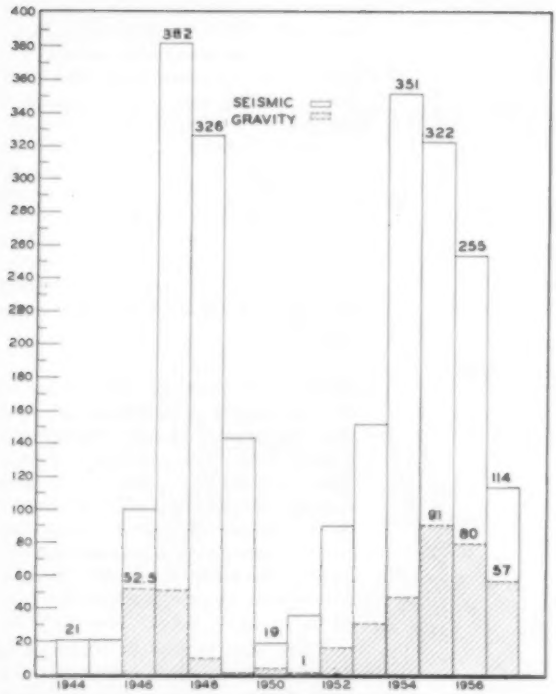
magnetometer in petroleum exploration work was reported in 1957. Since activity in aeromagnetic work expressed in crew-months is not considered to be meaningful, statistical information on the use of the method is usually expressed in line-miles or square miles of coverage. Aeromagnetic work reported in 1957 consisted of 18,300 line-miles in Arizona, 13,600 line-miles in New Mexico, 13,500 line-miles in Colorado and other Rocky Mountain states, and 28,000 line-miles in the Pacific Coast states and Alaska.

Where crews worked . . . Fig. 2 shows the geographic distribution of seismograph activity in the United States during 1957. The percentage figures shown on the chart indicate the percentage of the total U. S. seismic work reported during the year, and the (+) and (−) signs indicate increases or decreases in the percentage figures as compared to the year 1956.

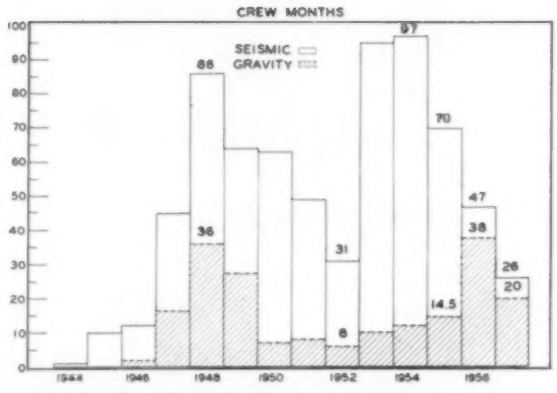
There were percentage decreases in Texas and Louisiana and in the Pacific Coast region, i.e., California, Oregon, Washington, and Alaska. All other major regions showed percentage increases. The states of Louisiana and Texas accounted for 52.4 per cent of the total U. S. seismic effort in 1957. The percentage of the work in these two states was 54.3 per cent in 1956 and 56.5 per cent in 1955. Seismic activity continued at a high level in the Rocky Mountain states due to continued interest in the Four Corners area, the common corner of the states of Colorado, Utah, New Mexico, and Arizona. Slight increases in activity were reported in the Mid-Continent states and in the southeastern states.

The distribution of gravimeter prospecting in the United States during 1957 is shown in Fig. 3.

Although there was some reduction from the 1956 level, activity in gravity exploration work continued high in the Rocky Mountain area during 1957. In 1956, 40 per cent of the total gravity work in the United States was carried on in this area, while the percentage of the total gravity effort in 1957 was 33 per cent. Gravity work in Texas during the year amounted to 33 per cent of the U. S. total. In the combined states of Texas and Louisiana 49 per cent of the total gravity work was done compared to 50 per cent in 1956 and 54.6 per cent in 1955. Slight percentage increases were reported in other major regions of the United States, with the exception of the Mid-Continent area, where the percentage



LOUISIANA OFFSHORE EXPLORATION, temporarily at least, has passed its peak and oil companies have entered the drilling phase, processing the seismic and gravity leads mapped in previous years. Fig. 4.



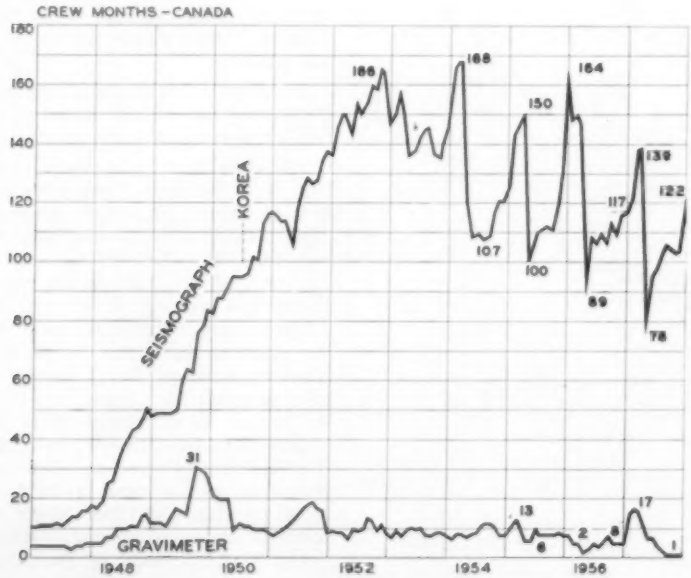
EXPLORATION OFF THE TEXAS COAST, too, has apparently passed its peak. Seismic activity here never reached the intensity shown along the Louisiana coast. (Compare with Fig. 4.) Fig. 5.

of total U. S. gravity activity was about equal to that in 1956.

Offshore surveys curtailed . . . During 1957, offshore geophysical operations were curtailed sharply. Fig. 4 shows the number of seismograph and gravimeter crew-months by years in the Louisiana portion of the Gulf of Mexico. In the gulf waters of Louisiana, exploration crews did 114 crew-months seismic work and 57 crew-months gravity work. This is a decline of 55.7 per cent in seismic and 28.7 per cent in gravity exploration activities. Shown in Fig. 5 are similar statistical figures on seismograph and gravity activity in the Texas portion of the Gulf of Mexico.

Geophysical explorations in the Texas offshore area in 1957 amounted to 26 crew-months seismic work and 20 crew-months gravity work, a reduction from the previous year of 57.4 per cent in seismic activity and 47.4 per cent in gravity activity.

Table 1 shows a tabulation of geophysical crew-months in the principal states of the United States. Also shown is a breakdown of the work according to company-owned and contract geophysical crews. Contract geophysical companies did 55 per cent of the seismic work and 56 per cent of the gravity work in 1957. In 1956, contractors did 57 per cent of the U. S. seismic work and 66 per cent of the gravity work.



CLIMATE has a marked effect on Canadian seismic activity, peaking during the winter when vast areas of muskeg can be surveyed. Fig. 6.

Canada

Explorations by geophysical methods were carried on by the petroleum industry in Canada during 1957 at a reduced rate as compared to the previous year's activity. Monthly variations in seismograph and gravity crew-months in Canada during the past 11 years are shown in Fig. 6. Increased activity in both seismic and gravity work was reported during the first 3 months of the year. Following the pattern of past years, there was a seasonal decline in seismic activity during April, May, and June, but activity increased in the following months.

The average number of seismic crews in operation in Canada during 1957 was 109 compared to an average of 119 crews in 1956 and 124 crews in 1955. An average of 6.7 gravity crews operated in Canada in 1957.

(For Canadian details, see page 232)

You can prevent overloading of plant compressors with careful selection of

The right motor for the right job

VERY OFTEN the statement is made to the effect that a compressor is really loaded or that a compressor is overloaded.

Just what is meant when such a statement is made? To really understand compressor loading let's first examine your automobile or power lawnmower. You can "kill" the engine of either of these machines if the power requirements become too high.

For example, if you let the clutch on the automobile out too fast the motor stops running or if the grass is too thick and too high the motor on the lawnmower will stop running. Why? To understand why let's go back to the term power. We really mean horsepower. Horsepower means the rate of doing work.

Now if we have a 600-hp. compressor we mean that the manufacturer has made the engine of the compressor large enough and the parts of the engine (such as connecting rods, bearings, shafts, etc.) strong enough to develop 600 hp.

To develop 600 hp. the engine must operate at the following conditions:

1. The pressure in the power cylinders must be right, for example, the spark plugs must fire properly and at the right time, and the fuel must burn correctly.

2. The length the power pistons travel from the top of their stroke to the bottom of their stroke is fixed by the manufacturer, but this travel must be taken into account in determining the engine horsepower.

3. The area of the power piston must be taken into account. This is determined by the manufacturer.

4. The number of times the fuel mixture is ignited per minute must be right. You must run the compressor engine at the correct number of revolutions per minute and the fuel must be properly ignited.

The compressor operator has control over two of the above conditions. These are: (1) you must be sure the fuel and ignition system are operating correctly and, (2) you must see that the engine is running at the correct speed.

A compressor is fully loaded if the engine is running at the correct speed and it is firing correctly and if the compressor end of the machine is pumping the amount of gas necessary to give the right pressure in the power cylinders.

Overloading compressor . . . A compressor is overloaded if it is running at a speed higher than recommended by the manufacturer or if the compressor end of the machine is pumping too much gas which in turn places a higher-than-recommended pressure on the power cylinder. (Suction pressure too high or discharge pressure too high.)

It is very undesirable to overload a compressor because the parts of the machine were not made strong enough to withstand the added pressure, added loads on the bearings, and added bending of shafts. The foundation bolting may fail and often a machine part will fail which will result in wrecking the major portion of the entire machine. In other words, if suction or discharge pressures are too high or if the machine is being operated too fast the machine is overloaded.

An overloaded compressor will result in high operating cost. For example, fuel consumption will be high and lubricating-oil consumption will be high. In addition, various parts of the machine will fail at relatively short life; bearings will wear fast, piston and piston rings will wear excessively, and valve trouble will be experienced.

Those who operate compressors should check the following conditions to determine whether the machine is operating correctly:

1. Maximum operating r.p.m.
2. Maximum operating suction and discharge pressure on the compressor end of the machine.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

Compressor Design Summary:

Rotary compressors use rotating impeller.

- Displacement type for moderate pressures.
- Turbo type for high-speed units.

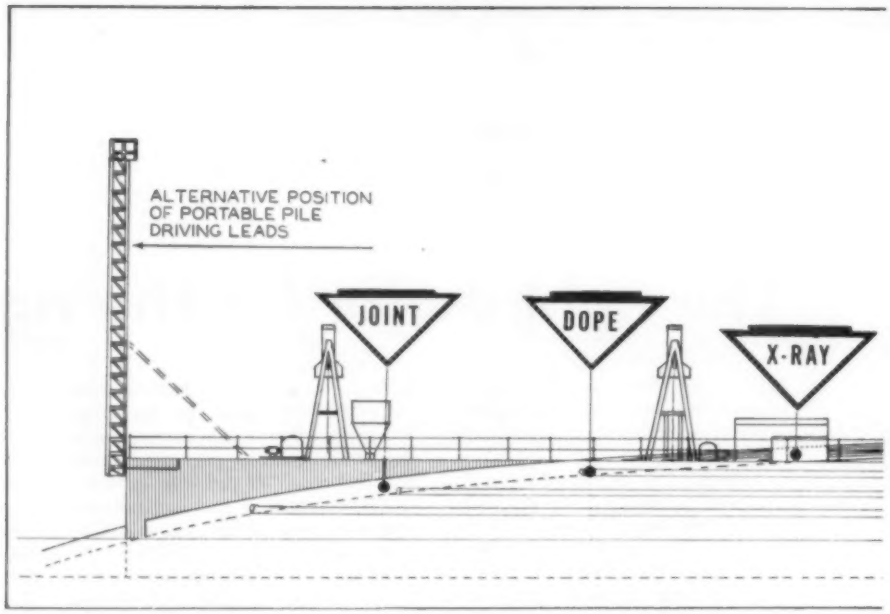
Reciprocating compressors use piston action.

- Single stage for small units.
- Multistage for higher pressures.

Beginning March 17: Operation of Compressors

IT'S SEAWORTHY and self-sufficient with the latest improvements to speed offshore pipelaying.

By **LARRY RESEN**
District Editor



New sea-going pipe layer

Brown & Root, Inc.'s, pipelaying barge, the L. E. Minor, is the latest addition to a growing fleet sparked by an upswing in offshore pipelining.

THE NEW VESSEL incorporates features making it virtually self-sufficient on the job. It is equipped with a traveling gantry crane capable of handling all lifting chores, including the setting up of small manifold platforms. It has facilities for setting risers and driving piling without the assistance of a derrick barge; also, it is equipped with a battery of davits for lowering and raising pipe over the side, again without outside aid. It can store additional pipe in special holds to insure against transportation delays; and it has no crew-transfer problems, being equipped with built-in air-conditioned quarters for 88 men.

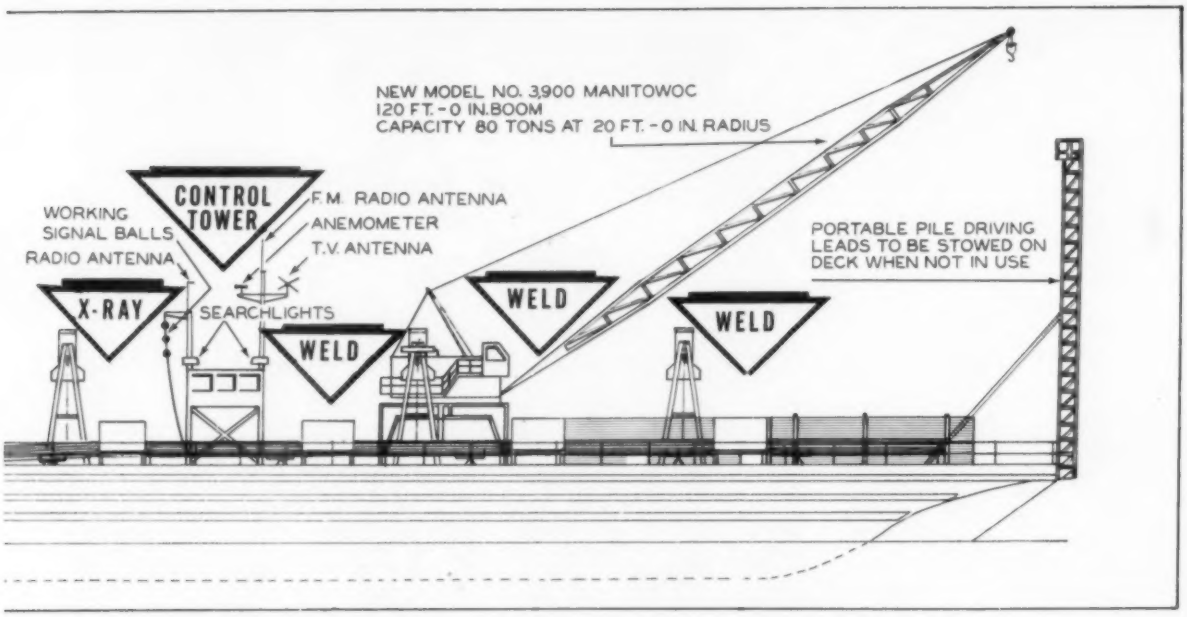
A special stalking machine moves pipe into position on the ramp and then hydraulically operated roller pads line up the pipe for stringer-bead weld. Other roller shoes along the ramp are individually controlled as to height to permit any required degree of curvature to be applied to the pipe.

The vessel, named the Ed Minor, Brown & Root's pipeline division vice president, has a gross displacement of 4,500 tons and dimensions of 350 ft. by 60 by 22½ ft. deep. It was built by Levingston Shipbuilding Corp., Orange, Tex. Unlike most barges, its forward end has been designed somewhat similar to a ship's prow. Its shape enables it to break a quartering sea, making it easier to tow and reducing the effect of waves which would normally break over the barge end, wetting wide areas.

Its over-all appearance is characterized by uncluttered deck space topside. Practically all machinery is located below decks. With the exception of the gantry crane, davits, and elevated deck house, the deck's silhouette is virtually flat. The automatic stalker eliminates the need for a crawler or sideboom tractor on deck. Cement and dope storage is below decks, as are the crew's quarters. About the only equipment topside are the pipe stalker, welding machines, and anchor winches. The cement mixer and dope kettle are below decks and deliver their products directly to the laying ramp through doors in the barge side.

Ramp . . . In the layout of the barge, the work ramp extends along its starboard side and is an integral part of the vessel. The 12-ft.-wide ramp is covered with a nonslip carborundum coating to provide sure, safe footing. It begins to slope downward about 10 ft. back from the bow and gradually turns downward with a 2,000-ft. radius curvature. It has roller shoes spaced 50 ft. apart along the ramp. These are equipped with rubber-covered rollers supported in roller bearings. They are arranged in a V-shaped pattern to enable various size pipe to be handled without change.

All of the shoes except those at the extreme ends of the ramp are provided with individual vertical positioners. These are operated off a central hydraulic system and are similar to grease racks in service stations, with the roller assembly being



mounted on the vertical cylinder which can be moved up or down. In this way any angle of curvature can be obtained. The shoe at the stern end is fixed vertically and horizontally, but is pivoted to permit a rocking movement of the pipe as it enters the water. This motion is necessary to allow for the movement of the barge. The stern end of ramp is equipped with a heavy reinforced coupler to which a reinforced sled-type stinger is attached for letting the pipe roll down to the sea bottom with a minimum of strain (OGJ, Nov. 4, 1957, p. 154).

Hydraulically operated lineup shoes are used at the forward end of the ramp for lining up each new joint of pipe to permit the stringer bead to be made. There are two of these shoes and they are mounted to move either up or down and sideways. This four-way movement makes possible alignment.

One set of rollers in the lineup shoes is powered to permit the pipe joint to be rotated to insure that seam welds are staggered. In operation, a joint of pipe will be rolled into the shoes by the automatic stalker. The operator standing at a console will then rotate the pipe and adjust the lineup shoes by simply operating the proper controls at his nearby console.

Stalker . . . The automatic stalker consists essentially of a frame on which pipe joints are placed by the gantry crane. Idler rollers move across this frame and are spaced to accommodate various sizes of pipe. The smaller the pipe size, the greater the number of rollers which will be assembled. The rollers are located near the frame, which is somewhat smaller than the 40-ft. random joint size of the pipe. Each joint of pipe is placed between a set of rollers when it is racked upon the stalker.

A chain drive pulls the roller shafts in a horizontal direction along the frame. The rollers, in turn, pull the pipe joints across the frame. The rollers themselves act as idlers, and the pipe joint is eased along the stalker frame until it reaches the end, where it is rolled into the lineup shoes. The same operator controlling the action of the lineup shoes also governs the movement of the pipe joints along the stalker.

"Stovepipe" Joints

Pipe joints are made up along the ramp in the conventional "stovepipe method": A joint at a time is added at the bow end, and various operations made on it as the barge is moved along. To this end, five welding stations have been set up plus an X-ray station, a doping station, and a concrete station for making the final field joint in the weight coating. As the pipe stops at each station a successive operation is conducted upon it until it enters the water at the stern end.

A control tower is located immediately above the work ramp. This has a cantilevered design so that the anchor man in the tower can have an unobstructed view of all stations. In addition, from his glass-enclosed structure he can watch the action of the tug as it moves the eight anchors as the barge moves along. The anchor man communicates with the tugs via short wave, directing them to move specific anchors, as needed.

Anchor winches . . . The barge is moved along by paying out or taking up slack in the eight anchor cables attached to 10,000-lb. anchors. Two of these are placed immediately forward and two aft of the barge in relatively straight lines, and four breast anchors angle out from each corner. Eight anchor winches handle the anchor lines. These winches are powered by dual 50-hp. motors and will each handle 3,000 ft. of 1½-in. galvanized wire line with a maximum pull of 50,000 lb. at 50 ft. per minute.

Direct current motors permit varying speeds from 50 to 200 ft. per minute. The winches are all located on the port side of the deck and the anchor lines run under deck gratings through guide sheaves to the four corners of the barge. The anchor man operates the winch motors through a console in the control house. The console control levers are laid out in a pattern simulating that of the winches on the deck.

As work is completed at various stations on the ramp, he operates the controls to take up slack in the forward cables and lets it out in the rear cables, moving the barge along the length of a pipe joint. Once this is done, the next joint is dropped from the stalking machine into the lineup rollers and operations are resumed along the work ramp.

As the cables near the end of their travel, the tug picks up individual anchors and spots them in a new forward location. This is done on a progressive basis so work is not held up pending relocation of anchors. All topside equipment including hoists and winches was supplied by Markey Winch Co., Seattle.

Current Supply

Electric current is supplied to the winches through an interesting and economical installation. The barge is equipped with three diesel-electric a.c. generating sets. The diesels are Caterpillar 12-cylinder D397 model turbocharged engines driving 350-kw. Columbia a.c. generators. Shaft extensions on two of these generators rotate the armatures of two Markey 250-kw. d.c. generators.

Under normal operations, the a.c. generators will supply general current to various electric motors throughout the vessel plus supplying current to the 15 welding machines. The d.c. generators supply current to the anchor-winch motors. It is possible to drive two sets of generators off one shaft, since when the barge is being moved, the welding machines will be idle. And when the welding machines are being used the winches will not all be in operation.

Only one winch will be worked intermittently while the barge is stationary. This will be when the tug is moving an anchor. With these general conditions prevailing there will be no significant load on the two d.c. generators when there is a load on the a.c. generators.

The generator sets are located below deck. In addition, auxiliary equipment consisting of starting air compressors, salt water, fresh water, potable water, bilge, ballast, and fire pumps are located below. A 160-psi., 150-hp. boiler provides steam for general purposes in addition to making it available for pile-driving operations. The machinery spaces are on two separate levels.

Wing tanks are used as storage for water, ballast, and salt water and additional fresh-water storage can be had in the 3½-ft. double bottom if desired. One of the tanks serves as skin cooling water supply for the engines. This water is circulated out of the tank through the engine and back to the tank.

The barge has fully air-conditioning quarters for 88 men below decks, together with eating facilities. Lounge and recreation rooms are equipped with radio and television for off-duty crews. Elimination of daily transportation problems with this arrangement will contribute greatly to the efficiency of any offshore pipelaying operation.

NEW BARGE slides off the ways at launching.

Five pipe-handling davits are spaced at 60-ft. intervals along the starboard side of the barge just inboard of the ramp. Each of these has a capacity of 35 tons and operates through a 20-ft. radius. When bad weather makes it necessary to back off the pipe, the end can be plugged, and the five davits with their individual hoists used to lift the pipe and swing it out over the side and lower it to the sea bottom. Buoys are attached at such a time and when the barge moves back into position, the davits are hooked on and lift the pipe back into position. This eliminates the need of a derrick barge at these times.

Welding Equipment

The barge is equipped with fifteen 400-amp. rectifier-type welding machines, a 23-bbl. hot-dope kettle, and a 16-cu. ft. cement mixer. The welding machines are clustered in groups of three adjacent to each welding station. The welders are always within about 10 ft. of their machines and can immediately make any adjustments desired. The various stations along the ramp can be equipped with collapsible aluminum shelters in bad weather. These fit into handrails when set up, and collapse flat when not in use for convenient stacking.

The traveling gantry crane is an 80-ton Manitowoc crane with a 120-ft. boom. It travels along a set of tracks laid 320 ft. along the center line of the barge. The wheels are double-flanged and equipped with hooks under the tracks to prevent tipping off in rough weather. It can operate anywhere along the deck and the boom extends over the edge of the barge so it can be used for general work, including pile driving and setting up small pipe manifold platforms.

It is built to clear all structures on the deck and travels through a pinion gear and rack arrangement with the rack extending along the deck parallel to the crane rails. To conserve space, a fuel tank has been constructed in one of the legs for supplying its diesel engine. The barge was constructed to American Bureau of Shipping standards and meets United States Coast Guard specifications enabling it to operate anywhere in the world.

Provision has been made to enable the barge to lay pipe coated with the new weight coating "Timcoat" (OGJ, Dec. 10, 1956, p. 114), if specifications call for it. This can quickly be done by mounting aboard the open deck space near the stern, the conveyors, heating equipment and hoppers, and the extruding carriage on the pipeline.

Acknowledgments

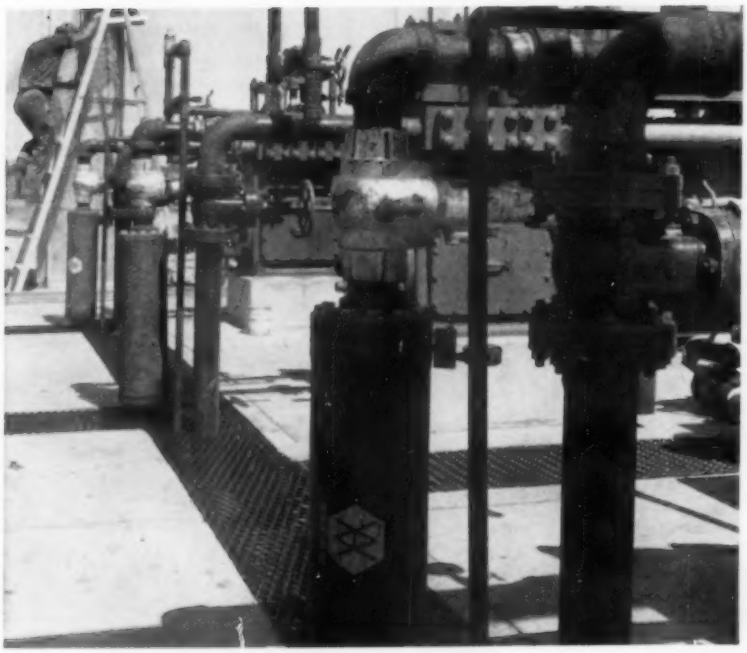
Cooperation of Brown & Root, Inc., in release of this information and assistance of F. R. Hauber, marine engineer, in its compilation is gratefully acknowledged.

Some oilmen are discovering . . .

Pressure surges can be tamed

by using a pulsation dampener

BY HARRY M. WYATT, JR.



TO PREVENT magnification of pressure surges, a pulsation dampener was installed at this water-flood pump station close to the discharge side of the water-injection pumps. Fig. 1.

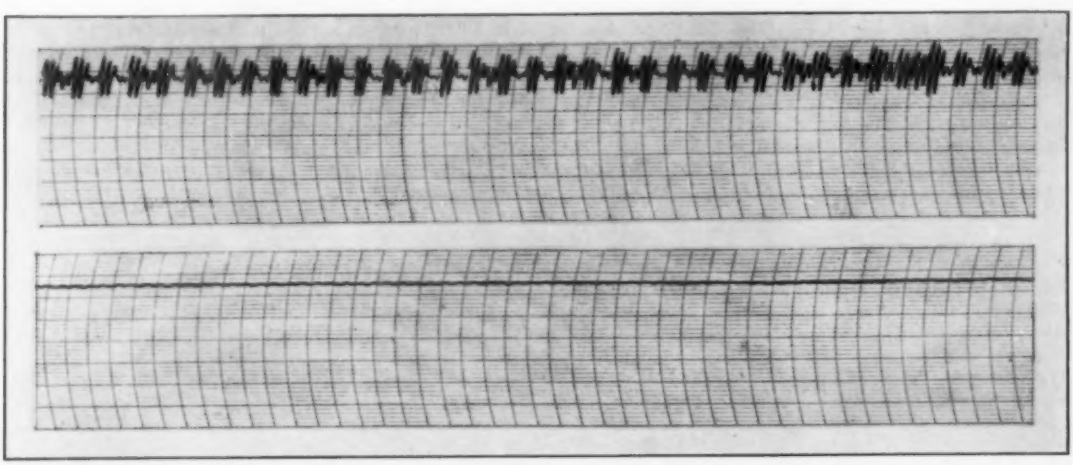
LEAKS AND LINE BREAKAGE in the flow line of a pumping oil well have practically been eliminated by installation of a pulsation dampener.

This installation consisted of a pump, 2¾-in. bore by 54-in. stroke, running at 21 s.p.m. The pulsation dampener tested was a Desurger.[1]

Since this pump is single acting, the pressure surges were very severe on the upstroke with practically no surges on the downstroke. Initial recordings indicated a variation in pressure from 20 psi. to 725 psi. each time the pump stroked. Maintenance on this system was unreasonably high.

Solution: A pulsation dampener was installed on the discharge of the pump close to the wellhead, and a check valve was located between the dampener and well to prevent backflow to well. Pressure recordings were again made and indicated a variation of 60-90 psi. when using the dampener.

Author is assistant professor of civil engineering, Oklahoma State University, and special representative, Industrial Products Division, Westinghouse Air Brake Co., Wilmerding, Pa.



USE OF A PULSATION DAMPENER is graphically shown in these pressure recordings of a 3 by 5-in. Triplex pump, 390 s.p.m. The top chart shows the pressure variations without the dampener and the bottom chart records the pressure variations after the pulsation dampener was put into use. Fig. 2.

This excellent surge dampening can be explained as follows: As the piston moved upward approximately one-half of the flow was accumulated in the surge dampener with the remainder moving on to storage tank. As the piston moved downward, the check valve closed, and the dampener discharged its accumulation into flow line. In this manner flow was continuous from dampener to storage which did not require starting and stopping of this fluid column.

The maximum flow velocity when using the surge dampener was less than one-half the maximum velocity when it was not used. Leaks around fittings and line breakage have been practically eliminated from this system since the installation of the dampener.

Water-flood operators have learned that eliminating pressure surges following injection pumps will:

1. Increase pump life.
2. Increase accuracy of flow meters while drastically reducing costly meter repairs.
3. Virtually eliminate joint leakage.
4. Boost station output through higher pump speeds without ill effects.

Field reports from California to Illinois show that all of these advantages and many more can be realized through the correct installations of a pulsation dampener to eliminate dangerous pressure surges. Uncontrolled pressure surges needlessly rob the operators of power which if utilized could increase the operating efficiency of the entire plant.

Effect of compounding . . . In installations involving more than one pump or multiple-cylinder pumps additional pressure surge problems are presented. Each pump creates a pressure surge every time each valve closes. By themselves these surges may not be large enough to present too great a pressure increase.

But as these pressure surges come from each pump into the header they are compounded. This results in a series of periodic pressure pulsations traveling the length of the line (or header) at sonic velocity.

These pressure waves are sometimes reflected from the closed end of the header or other obstruction in such a way that the reflected pressure waves are in phase with the incident pressure waxes thus creating standing pressure waves. The result is that pressure surges are magnified.

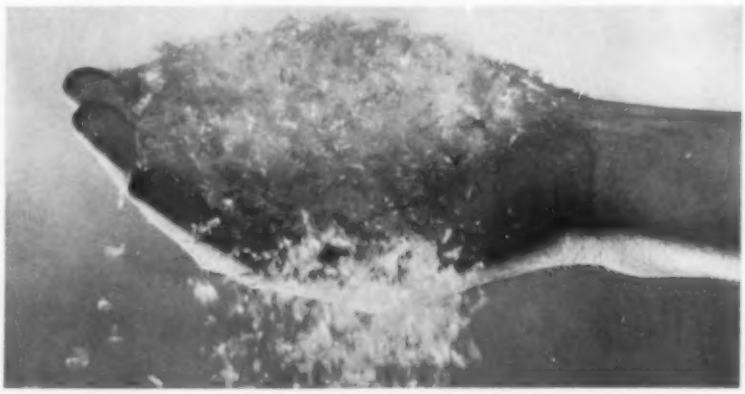
Elimination of surges . . . In order to prevent this from happening, a pulsation dampener of sufficient size should be installed as close to the discharge side of the pump as possible. This eliminates or reduces surges before they enter the pipe system. Fig. 1 shows dampeners installed on the discharge of water injection pumps.

Fig. 2 shows the pressure recordings from the discharge of a 3 by 5 in. triplex pump, California area, before and after the installation of a through-flow, dual-acting in-line pulsation dampener. The dampener was installed between pump and pickup. These runs were recorded with electronic pickups. This is definite proof of the protection against pressure surges that is afforded by a properly designed pulsation dampener.

During the investigation of this installation the operators were planning to install a new pump to increase their flow capacity. The double-acting triplex pumps were running at 310 s.p.m. With the installation of the pulsation dampeners, pump speed was increased to 390 s.p.m. Thus with four pumps the operator experienced an increase of $(390 - 310) \times 4 = 320$ s.p.m. or in reality he obtained additional capacity equivalent to what one new pump would produce. This increase in capacity was realized with only a small investment that is four pulsation dampeners, as compared with one 3 by 5-in. triplex pump.

Reference

1. Westinghouse Air Brake Co., Industrial Products Division trade name.



Plastic flakes can solve tank leakage

THE USE of fragmented plastic foil flakes has been found to be an inexpensive yet efficient answer to the problem of leaking oil storage tanks.

In a typical example recently, a large crude-oil-storage tank on a tank farm developed a leak. It was impossible to determine the exact location of the leak, but it was believed to be around the sump for the water drawoff. It was hoped that B.S. would be drawn into the leak and seal it off. This did not happen, however, and the leak continued to grow larger.

Fifty lb. of Dowell Incorporated's Jelflake, fragmented plastic-foil flakes, was pumped through the water drawoff connection. Within a week, the leak had diminished, and after 2 weeks it had been sealed off completely. Even after the mixer on this tank had been in operation for more than a week there were still no signs of any leakage.

Each bag of flakes contains plastic particles ranging in size from pin head to 2 in. in diameter. Because the particles average only 1/1,000 of an inch in thickness, the contents of a 25-lb. bag can cover a surface of nearly 500,000 sq. in.

The lightweight particles are drawn into the holes in the tank, sealing them off, and are laid in place by differential pressure. These plastic flakes are chemically inert to any of the various well fluids stored in crude-oil-storage tanks. As they do not take part in any chemical reactions, they tend to form a permanent seal against seepage.

The flakes can be readily mixed into any fliud used as a carrying agent. Because of the crinkled texture and the extreme thinness of the individual flakes, they suspend uniformly, without balling up. They are clean, easy to handle, and trouble free.

The fluid contining the suspended flakes may be pumped into the tank through the opening at the top or through the manhole. For best results, it should be pumped into the tank as close as possible to the area of the suspended leak. Experience has shown that a complete shutoff of the leak is usually obtained about a week after application.

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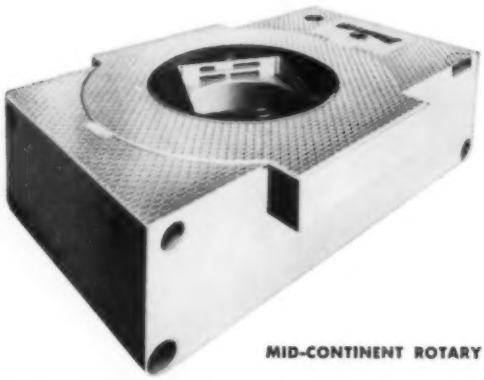
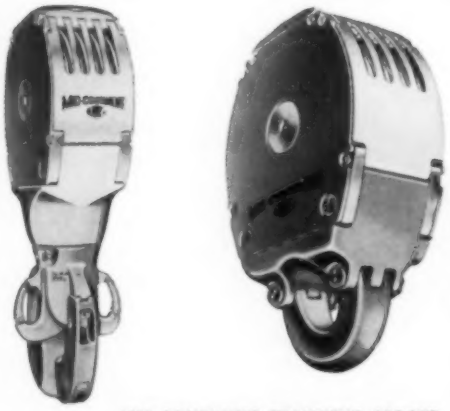
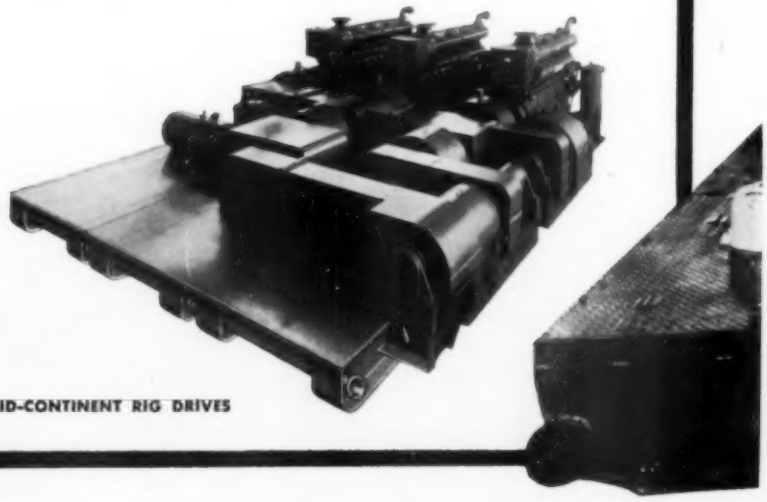


MID-CONTINENT ROTARY TABLES



MID-CONTINENT TRAVELING BLOCKS



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Smooth vs. grooved drums

Which is better for your job?

SMOOTH DRUMS worked fairly well on rotary-drilling hoists until the operators, for economic reasons, began buying longer lines so that new line could be progressively fed into the spooling system and some line cut off at the drum-end clamp as wear and pulldown in line size occurred.

This practice requires that new line be fed into the spooling system on top of worn line. When a layer of worn line is hammered up snug on the drum core, as a foundation layer, its worndown condition makes it impossible to track a layer of new-line wraps of a larger diameter on top of the layer of worn wraps. What results during this speedy operation, with the new line failing to track on worn line and the succeeding layers being spooled in a reverse helix, is that the wraps of the line slip over under weight pressure and wide gaps are left at varying intervals so that the next layer of line cuts into these gaps.

Smooth-drum spooling also became very expensive for drilling-rig operators because of the lost time and the uncertainty of whether or not the line was going to spool correctly after it had been hand spooled. In smooth-drum line spooling, it is necessary to use a complete layer of line across the drum, and back four to six wraps on the second layer, which is against the helix, at which point the load is picked up.

This first layer of line on the drum is considered by most operators as being a spooling method which eliminates the use of a grooved drum, but this spooling practice requires more line in the spooling system and the line is spooled in the old helical manner.

Some problems are encountered where wire line is spooled onto a plain smooth drum core of a rotary drilling hoist under normal conditions.

This type of spooling is also universally used on winch-line drums where constant tension to keep the line tight cannot be held; this is called loose-line spooling.

Engineers have the answer for the problems of loose-line spooling on winch drums and have made it practical to spool winch lines on a grooved drum.

Tight-line spooling is now being done successfully on drums grooved by counterbalance grooving methods that cause wire line to spool uniformly without cutting in and counterbalancing the hoisting drum as far as the wire line is concerned.

In the past, one of the greatest sources of trouble in wire-line spooling has been the wire line cutting into the preceding layers. This cutting in is due principally to the haphazard or uncertain line action of helical spooling. With helical spooling, it is difficult to prevent worn line from slipping over while lifting excessively heavy loads. With single-crossover pyramid spooling, 75 to 85 per cent of the wire line forms grooves for the succeeding wraps which accomplished progressive grooving. This is satisfactory spooling for up to three layers of line.

The new type counterbalance spooling described throughout this series creates progressive grooving and has two parallel sections and two short twin crossovers. The mechanically perfect spooling system obtained by counterbalance spooling is not limited to any number of layers of spooling.

Counterbalance Spooling

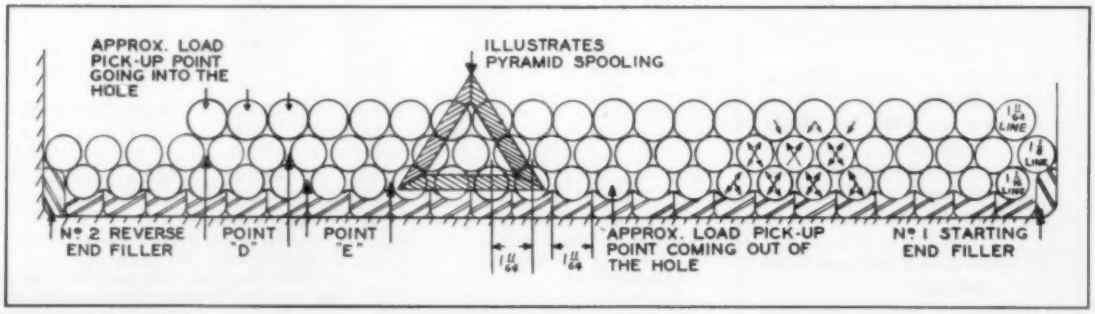
Counterbalance spooling has a smooth and correct spooling pattern. It is the only system unlimited to number of layers to be spooled.

This type spooling will allow the operator to wear his line down to a smaller diameter and still permit better service than possible with any other spooling system.

The first advantage is the elimination of cutting in.

Second advantage is less crossover angle which reduces scrubbing, pinching and facilitates faster spooling. Most scrubbing occurs at the crossover points. The single-crossover system has to cross the top of two lines on the previous layer at one pass to progress the necessary pitch. With the new counterbalance system where two crossovers are employed, the line only crosses one-half a pitch each time, and thus only crosses a single line each pass. This virtually eliminates scrubbing at the drum due to the crossover on multilayer spooling.

Taken from Lebus-International Engineers, Inc., wire-line-spooling handbook.



COUNTERBALANCE and single-crossover pyramid spooling on a grooved drum hold line on a definite maximum center despite worn condition of first layer.

BY W. L. NELSON, Technical Editor

Fuel—Price and Cost at Average U. S. Refinery

EXAMINATION of Table 1 on this page indicates clearly that the fuel costs for any particular operation must be based on the actual cost or value of fuel at that place. However, averages for the entire U. S. industry are given in the last columns of Table 1.

Approximations of the prices or costs in particular regions can also be estimated from Table 1. For example, in the Gulf of Mexico or Caribbean area the cost of fuel oil during 1948 was \$2.14 × 1.28 (Index of 128 in Col. 1) or \$2.74 per barrel. Such a fuel has a heating value of about 6.4 million B.t.u. per barrel (note figure at the year 1956) and the cost per million B.t.u. is 2.74 divided by 6.4 or \$0.428. If the refinery is an average one, 632,000 B.t.u. is needed (Col. 14) and the cost of fuel is 42.7 times 0.632 or 27.0 cents per barrel of crude oil. This is a higher cost than the average shown in Col. 15 (i.e. 16.3) because of the relatively high value or price of Bunker C fuel at the Gulf Coast during 1948, especially high in relation to gaseous fuel. The cost at the Gulf Coast is ordinarily lower than at most points. Note that less than 632,000 B.t.u. is absorbed as useful heat by an amount which depends upon the thermal efficiency of the refinery operations.

PROCESS COSTIMATING—FUEL COSTS

No.

3—March 10, Heating Values
4—March 17, Fuel Price and Refining Costs
5—March 24, Average Fuel Costs
6—March 31, Fuel Costs (World)
7—April 7, Fuel for Major Processes
9—April 21, Fuel for Average Refinery
10—April 28, Fuel vs. Crude Gravity
11—May 5, Fuel vs. Severity of Refining
12—May 12, Fuel for Lube Refinery

The kinds of refinery fuels are indicated in Table 2, and the major refining areas in Table 3. Note especially that about half (average of 43.0 per cent) of the fuel cost of Table 1 is gas produced in the refinery. The composition and heating value of various refinery gases was presented in Table 3 of Process Costimating No. 3 as well as similar information about residual fuels, pitch, acid sludge and coke.

The cost of fuel at various points throughout the world will be developed in Processing Costimating No. 6 of March 31, 1958. Basically the cost of refinery fuel is usually related to the value of residual or Bunker C fuel oil, although in a few areas cheap coal or cheap natural gas is available.

Table 1—Price Indexes and Prices* of

	Bunker C fuel price indexes[a]				
	Gulf or Caribbean cargoes (1)	N. Y. Harbor barges (2)	San Pedro (Calif.) bunkers (3)	Central Michigan (4)	Oklahoma northern shipments (5)
1926	64.4	64.0	46.0		
1928	35.8	43.5	41.8		
1930	33.2	40.3	35.5		
1931	24.5	30.8	30.7		
1932	21.3	26.6	30.4		
1933	28.7	32.3	33.2		
1934	40.2	45.5	39.2		
1935	34.1	39.2	42.1		
1936	37.8	39.8	43.3		
1937	40.8	46.9	58.0	40.1	
1938	31.4	38.3	41.4	30.8	
1939	36.2	38.3	38.0	32.6	
1940	39.2	49.1	38.3	34.8	25.5
1941	38.8	49.4	38.2	47.5	35.9
1942	38.1	59.1	40.0	48.0	40.9
1943	46.0	67.0	48.6		41.0
1944	45.6	67.0	51.5	49.2	45.0
1945	43.3	62.2	51.5	49.3	44.4
1946	55.5	64.8	57.0	56.5	55.0
1947	91.0	84.0	72.6	93.0	95.2
1948	128.0	110.2	98.8	111.0	115.7
1949	69.5	69.6	76.9	85.5	51.2
1950	78.0	76.9	65.8	86.1	77.7
1951	81.5	85.5	83.1	96.0	85.4
1952	78.3	84.9	79.8	90.5	57.1
1953	81.0	77.8	83.6	85.1	54.9
1954	85.9	82.6	84.3	86.5	62.0
1955	90.9	91.2	85.9	94.6	82.4
1956	100.0	100.0	100.0	100.0	100.0
1956 price[d]	\$2.14	\$2.76	\$2.16	\$3.53	\$2.03
Heating value[d]	6.4	6.2	6.3	6.4	6.4
1957	123.8	112.3	129.2	105.3	105.3

*See year 1956 for prices. The price can be converted to other years by means of the indexes.
†Approximate.
‡Estimate.
[a]Bunker C fuel, no sulfur guarantee, average of lows of Platt's Oil Price Handbook.
[b]USBM data.
[c]1946 price, 3 cents per M.c.f.
[d]1946 price, 7.4 cents per M.c.f.
[e]Weighted average including 35-40 per cent of Southwestern and Pacific gas. Refinery gas and catalytic carbon are considered to have the same value as residual fuel at that loca-

TABLE 2—KINDS OF REFINERY FUELS (1955)*

	Per cent of heat used	
	All sources	Outside or saleable
Oil fuel	13.7	13.7
Coal	1.2	1.2
Natural gas	37.4	37.4
Refinery gas	43.0	....
Coke†	4.2	‡0.4
Acid sludge	0.5	....
Total	100.0	52.7

*Analysis of USBM data. †Including coke burned from catalyst. ‡Estimate.

TABLE 3—MAJOR REFINING AREAS

	Approx. per cent U.S.A. capacity	Price schedule* used in Table 1
Texas, La., and Ala.	25	Gulf Coast cargoes
Pa., N. J., and N. Y.	24	N. Y. Harbor bunkers
Calif.	14	San Pedro bunkers
Ill., Mich., and Ind.	13	Central Michigan sales
Okla., Kans., Mo.	7	Okla. (northern shipments)
Ohio	5	....
Others	12	....

*Platt's Oil Price Handbook and publications.

Refinery Fuels, and Approximate Fuel Costs in Average U.S.A. Refineries

Gaseous fuel prices and indexes[b]					Avg. refinery fuel price (approx.)			Fuel used[k] and its cost (approx.)	
						Cents per 10^6 B.t.u.			
Price field use† (6)	Price, carbon black plants† (7)	Index, Southwest Texas[c] (at well) (8)	Index Pacific[d] (at well) (9)	Price, U.S.A. total† (at well) (10)	Index (U.S.A.)[e] (11)	Developed[f] (12)	Absorbed[k] (13)	Thous. B.t.u. per bbl.[g,j] (14)	Cents per bbl.[h,j] (15)
....	....	58.2	37.0	9.5	61.0	17.0	22.6	832	14.1
....	....	34.8	39.6	8.9	44.6	12.4	16.5	667	8.3
....	....	36.8	33.8	7.6	41.2	11.5	15.3	672	7.7
....	....	22.5	31.5	7.0	31.6	8.7	11.7	682	6.0
....	....	22.5	29.2	6.4	29.4	8.2	10.9	692	5.6
....	....	24.5	28.8	6.2	32.7	9.1	12.1	660	6.0
....	....	22.5	31.5	6.0	38.0	10.6	14.1	638	6.8
....	....	21.4	31.5	5.8	35.6	9.9	13.2	615	6.1
4.6	1.3	23.5	29.2	5.5	36.6	10.2	13.5	597	6.1
4.8	1.3	23.5	29.7	5.1	38.6	10.7	14.3	562	6.1
4.5	0.9	22.5	31.1	4.9	34.3	9.5	12.7	567	5.4
4.2	0.9	21.4	28.0	4.9	33.7	9.4	12.5	555	5.2
3.8	1.0	18.4	25.2	4.5	33.3	9.3	12.3	579	5.4
4.4	1.1	20.4	27.0	4.9	36.2	10.1	13.4	584	5.9
4.2	1.3	22.5	29.7	5.1	38.7	10.8	14.4	629	6.8
4.3	1.5	24.5	29.2	5.2	42.0	11.7	15.6	659	7.7
4.3	1.6	25.5	28.8	5.1	43.5	12.1	16.1	692	8.4
4.4	2.3	26.6	27.0	4.9	42.7	11.9	15.8	688	8.2
4.6	3.0	30.6	33.3	5.3	49.6	13.8	18.4	653	9.0
5.3	3.6	38.8	46.0	6.0	68.8	19.1	25.5	647	12.4
6.0	4.7	46.0	50.8	6.5	89.5	24.9	33.2	632	15.8
6.2	4.8	47.0	53.1	6.3	66.0	18.4	24.4	687	12.7
6.2	4.8	48.0	53.6	6.5	70.3	19.6	26.0	658	12.9
6.8	5.2	55.1	65.7	7.3	79.6	22.1	29.6	646	14.3
7.8	5.5	63.4	75.3	7.8	81.0	22.5	30.0	626	14.1
....	....	77.5	88.6	9.2	87.0	24.2	32.2	641	15.6
....	....	86.2	92.7	10.1	86.5	24.0	32.1	677	16.3
....	....	93.0	97.6	11.0	93.0	25.8	34.5	698	18.1
....	....	100.0	100.0	‡11.8	100.0	27.8	37.0	‡720	‡20.0
....	....	‡[c]$0.098	‡[d]$0.222	‡11.8	....	....	....	....	....
1,200	1,150	1,200	1,150	1,175	....	....	....	....	....
....	....	‡117.6	‡110.0	‡13.7	115.7	32.2	42.9	‡740	‡23.8

tion.

[f]One million B.t.u. of gross heating value. Divide by thermal efficiency (see Column 13) to obtain cost of absorbed (or useful) heat.

[g]USBM's averages for U.S.A. for all fuels used in refineries including refinery gas and catalytic coke.

[h]Col. 14 times fuel cost (Col. 12) divided by a million.

[j]Heating value and price; gross millions B.t.u. per barrel and dollars per barrel; also gross B.t.u. per cubic foot and cents per M.s.c.f.

[j]Including any gas produced (average 43 per cent of heat generated) in the refinery and any coke burned. Thus, the refinery income should include the value of any gas produced as well as coke burned from catalyst.

[k]At an average efficiency of 75 per cent based on gross heating value. Col. 12 ÷ 0.75.

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Among the Drilling Contractors

Deep Knox Well Sets New Record in Fast Drilling

Viersen & Cochran, contract-drilling firm headquartering at Okmulgee, Okla., recently set a new speed record for South Oklahoma's deep Carter-Knox area when it drilled to 14,500 ft. in 127 days from date of spudding.

The record was set in a well it is drilling under contract for British-American Oil Producing Co., major operator in the area. The well, 1-C Leona Hayes, in 32-3n-5w, is on the Grady County side of the two-county area. It now is drilling below 16,750 ft.

Viersen & Cochran's Rig 9 on the job is an Emsco J-1250, powered by three V-125 Climax 530-hp. engines, and using, two Oilwell 222P 8 by 20-in. 650-hp. pumps. It has a Lee C. Moore standard derrick with 14-ft. substructure. John Jones, tool pusher, headquarters at Duncan.

This well is one of five now drilling in the field below 16,000 ft. Three are for British-American on the Grady County side, and one each for British-American and Gulf Oil Corp. in Stephens County.

Production in the field is from lower Simpson sands below 15,000 ft., the deepest in Oklahoma and the fourth deepest in the country.

DEEP DRILLING rig used by Viersen & Cochran in setting new speed record 14,500 ft. in South Oklahoma's Carter-Knox field.

Laurel Contractor Takes 12-Well Alabama Project

Gulf Coast Drilling & Exploration, Inc., Laurel, Miss., contracting and operating firm, is undertaking an exploration and development project involving the drilling of 12 wells in the South Carlton area of southern Clarke County, South Alabama.

The wells will be drilled on a block of 5,187 acres assembled by C. Dale Armour, Jackson, Miss. Leases embrace land owned by the J. H. Wall Estate adjoining productive acreage on the South Carlton salt dome.

First of the wells is scheduled to be started within 3 months. Others will be drilled consecutively, or as development warrants. They will test the Lower Tuscaloosa sands productive on adjoining acreage, now operated by Clarkwin Oil Corp. These sands are found at depths below 5,400 ft.

South Carlton field, associated with one of South Alabama's three known salt domes, was discovered in 1950 by Humble Oil & Refining Co. It has 11 producing wells, making about 300 bbl. per day on artificial lift. Productive area stretches from southern Clarke County into northern Baldwin County.

Gulf Coast Drilling & Exploration, Inc., was one of the more active contracting firms in the development of Alabama's large Citronelle field, about 20 miles southwest of South Carlton, in Mobile County.

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AAODC Plans New Series Of Drilling-Mud Schools

The American Association of Oilwell Drilling Contractors will sponsor a new series of drilling-mud schools for field personnel beginning early this spring.

Dates and locations for the schools are now being worked out by the association's Education and Training committee, headed by H. W. Davidson, of Davidson Drilling Co., Midland, Tex.

The schools will be conducted by the Petroleum Extension Service of the University of Texas. Each will present a 30-hour program in 10 3-hour periods. Courses will deal with the "Principles of Drilling-Fluid Control." They will be available to all field drilling personnel in the areas where the schools are held. Morning and evening classes will be arranged so men working different tours may attend.

More than 8,500 tool pushers, drillers, and crewmen have received mud-school training since the first course was started in 1946 as the first AA ODC-sponsored training program. The program has been given only occasionally in the last 5 years. This has been partly because it was felt the training "saturation point" had been reached in many areas, Davidson explained.

The schools now are reactivated because a virtually new "student body" for the course now is employed in the drilling industry, Davidson said.

Field Drilling Co., San Antonio, is getting under way on another well Manor Oil Co. and Elms & Eckert are putting down to confirm their recent dual-zone Wilcox gas-condensate discovery 12 miles southwest of George West, in Live Oak County, South Texas. The new operation, 1 Dougherty Estate, is 2,000 ft. north of the operators' Striebeck discovery well, drilled to 7,430 ft. It is scheduled to go to 8,000 ft.

Prince Marine Drilling Co. has contract for a wildcat in Acadia Parish, Louisiana, for Southwest Gas Producing Co. The 1 Edward E. Daigle fee, a 10,500-ft. try, will be drilled in 37-7s-2e.

Longhorn Drilling Co. has contract for J. C. McCabe 1 Josephine A. Minus, a Dimmit County, Southwest Texas wildcat. The well is 3 miles northeast of Asherton in Section 79, J. H. Gibson Survey, A-806. The District 1 wildcat will go to about 4,500 ft.

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PIPELINE

CONSTRUCTION REPORT

Who's Laying Line—and Where

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way.

U.S. Crude-Oil Pipelines

- **Belle Fourche Pipeline Co.**
  Project: 30 miles of 6-in. from Donkey Creek pool to Fiddler Creek pool in northeastern Wyo. Will later build a line from Fiddler Creek to connect with Butte Pipe Line Co. near Osage, Wyo.
  Status: Planned.
- **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.)
  Project: Line from lower Delaware Bay to Philadelphia.
  Status: Planned.
  Completion: 1960.
- **El Paso Natural Gas Products Co.**
  Project: Verde Gallup-Horseshoe Canyon gathering system, San Juan County, New Mexico; 42 miles of 2, 3, 4, 6, 8-in.
  Status: Under way.
  Contractor: **Northwest Construction, Inc.**, Farmington, N. M.
  Completion: April 1958.
- **Gillette Pipeline, Inc.** and **A. W. Hartwig, Inc.**
  Project: A 102-mile line from Dead Horse Creek field to Casper. Wyo.
  Status: Has applied for permit from Wyoming Public Service Commission.
- **Great Northern Railway Co.**
  Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Montana and North Dakota, to Clearbrook or St. Paul, Minn.
  Status: Planned.
  Contractor: **Pipe Line Technologists, Inc.** has completed feasibility study.
- **Humble Pipe Line Co.**
  Project: 90 miles of 16-in. from Hawley to Comyn, Tex.
  Status: Under way.
  Contractor: **O. R. Burden Construction Corp.**, R. M. Jones, supt., office at Cisco, Tex.
  Completion: Summer 1958.
- **Jayhawk Pipeline Corp.** (Colorado Oil & Gas Corp., National Cooperative Refinery Association)
  Project: 242 miles of 10 and 12-in. from western Meade County, Kansas, to Valley Center near Wichita.
  Status: Will start spring 1958.
  Contractor: **Pipe Line Technologists**, Houston, has engineering contract.
  Completion: August 1958.
- **Offshore Gathering Corp.**, Houston.
  Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)
  Status: Proposed.
- **Oil Field Pipe Line, Inc.**
  Project: 200 miles 8 and 12-in. from near Elkhart, to Ellinwood, Kans.
  Status: Proposed.
- **Portland Pipe Line Corp.** and **Montreal Pipe Line Co., Ltd.**
  Project: 39 miles of 24-in. loops in U. S. and 11 miles in Canada along its 242-mile dual 12 and 18-in. system between Portland, Me., and Montreal, Que.
  Status: To start spring 1958.
- **Service Pipe Line Co.**
  Project: 75 miles of 20-in. between Casper and Laramie, Wyo.
  Status: Planned.
  Completion: Summer or fall 1958.
- **Shell Oil Co.**
  Project: 17 miles of 3, 4-in. in La. Delta area.
  Status: Under way.
  Contractor: **Brown & Root, Inc.**, W. P. Stanley, supt., office at Buras.
  Completion: March 31, 1958.
- **Shell Pipe Line Corp.**
  Project: 11 miles of 8-in., 3 miles of 10-in., 10 miles of 12-in., 37 miles of 16-in., and 60 miles of 20-in. from Mississippi River Delta area to New Orleans refining area.
  Status: Planned.
  Contractor: **Coates Field Service, Inc.**, has right-of-way acquisition and claims settlement.
  Completion: September 1958.
- **Sinclair Pipeline Co.**
  Project: 150 miles of 20-in. from Teague, Tex., to Houston.
  Status: Under way.
  Contractor: **Lone Star Constructors, Inc.** has 143 miles; **Golightly Construction Corp.** has 6 miles.
  Completion: June 1958.
- **Southern Kansas Pipeline, Inc.**
  Project: 200 miles of 6 to 10-in. in Kans. from southwestern Meade County to 10 miles north of Arkansas City.
  Status: Proposed. Request filed with Kansas Corporation Commission for permit.
- **Texas-New Mexico Pipe Line Co.** (Sinclair, Texas Co., Tidewater, Empire)
  Project: 512 miles of 16-in. from southeast corner of Utah to Jal, N. M.
  Status: Under way.
  Contractor: **Four Way Co., Inc.**, has 150 miles from Aneth field southeast. **Panama, Inc.**, has remaining 362 miles from Cuba to Jal to complete March 1, with two spreads; T. F. Rashell, supt., office at Estrancia, and Eugene Coulter, supt., office at Roswell.
  Comp'etion: May 1958.
- **Toronto Pipeline Co.**
  Project: System to connect fields in Cheyenne, Morrill, and Banner counties, Nebr., to Platte Pipe Line Co.'s 20-in. line from Wyoming to Wood River, Ill., and 13 miles of 4-in. plus field lines to Platt's Redding station.
  Status: Planned.

U.S. Products Pipelines

- **Alaska-Yukon Refiners & Distributors, Ltd.**
  Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on Canol line, to Anchorage.
  Status: Proposed.
  Completion: 1959.
- **American Pipe Line Co.**
  Project: Line from Gulf Coast to New York City. Has ODM approval to amortize 40 per cent of cost with fast writeoff.
  Status: Proposed.
- **Buckeye Pipe Line Co.**
  Project: 70 miles of 8-in. from Wayne to vicinity of Durand, Mich.

PIPELINE CONSTRUCTION

Status: Planned.
Completion: 1958.

- **Cherokee Pipe Line Co.** (Continental Oil Co., Cities Service Oil Co.)

Project: 78 miles of 12-in. from Ponca City to Tulsa, Okla.
Status: Under way.
Project: Conversion of 400 miles of 10-in. crude line between Glenpool, Okla., and Wood River, Ill.
Status: Planned.

- **Clark Oil & Refining Corp.**

Project: 15 miles of 8-in. from Blue Island, Ill., to Hammond, Ind., area.
Status: Under way.
Contractor: **Midwestern Contractors, Inc.,** Wheaton, Ill.
Completion: Spring 1958.

- **Columbia Gas System, Inc.**

Project: Line from proposed plant near Kenova, W. Va., to proposed plant and storage facilities at Siloam, Ky.
Status: Planned.
Status: Proposed.

- **Everglades Pipe Line Co.**

Project: 60 miles of 10-in. from Port Everglades, Fla., to Miami's International Airport and terminals south.
Status: Under way.

- **Gulf Refining Co.**

Project: 60 miles of 8-in. propane and natural gasoline line from Barbers Hill to Port Arthur, Tex.
Completion: March 1958.

- **Katy and New York Central Railroads**

Project: 2,000 miles of 10 or 12-in. from Houston through Kansas City, St. Louis, Indianapolis and Cleveland to Syracuse then down to New York City. A branch would go through Chicago to Detroit.
Status: Planned.
Contractor: **Williams Brothers Co.** has feasibility study.

- **Laurel Pipe Line Co.** (Gulf Refining Co., Sinclair Pipe Line Co., The Texas Co.)

Project: 100 miles of 24-in. and 340 miles of line graduating down to 14-in. at the west terminus, from Philadelphia to Cleveland.
Status: To start April 1958.
Contractor: **Pipe Line Maintenance & Construction Co.,** Camp Hill, Pa., has Susquehanna River crossing. **Missouri Valley Dredging Co.,** Omaha, Neb., has 6 miles of 24-in. from Eagle Point, N. J., to west bank of Delaware River, including Delaware River crossing, and 20 miles of 24-in. from west bank of Delaware River to Laurel's Booth station site in Delaware County, Pennsylvania. **Engineers Limited Pipe Line Co.,** San Francisco, has 106 miles of 24-in. from Booth station to Mechanicsburg station near Harrisburg, Pa. **Panama, Inc.,** Houston, has 78 miles of 20-in. from Mechanicsburg station to Duncansville station, and 113 miles of 18-in. from there to Aliquippa station in Beaver County, Pennsylvania, including Allegheny and Ohio rivers crossing. **Williams Brothers Co.,** Tulsa, has 106 miles of 14-in. from Aliquippa station to Cleveland.
Completion: August 1958.

- **Leonard Refineries, Inc.**

Project: 43 miles of 6-in. from Alma to Lansing, Mich.
Status: Planned.
Contractor: **Welded Construction Co.**
Completion: Spring 1958.

- **Ohio Oil Co.**

Project: 265 miles of 12-in. from Wood River, Ill., to Chicago.
Status: To start July 1958.
Completion: 1958.

- **Underground Storage & Exploration, Inc.**

Project: 393 miles of 12-in. L.P.G. line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.
Status: Proposed.

- **Union Oil Co. of California**

Project: 815-mile line from Rifle, Colo., to Los Angeles refining area.
Status: Proposed.

U.S. Natural-Gas Pipelines

- **American Louisiana Pipe Line Co.**

Project: 7 miles of 16-in. and 5 miles of 12-in. from Second Bayou to Cameron, La.
Status: Under way.
Contractor: **Ford, Bacon & Davis Construction Corp.**
Completion: December 1958.

- **Arkansas Louisiana Gas Co.**

Project: A 300-mile line, plus gathering lines, from Tex.-La. coastal area to northern La., to connect with present system.
Status: Long-range plans.

- **Carnegie Natural Gas Co.**

Project: Two parallel lines to provide coke-oven gas to six Pittsburgh area plants: 9 miles of 55-in. and 4 miles of 43-in. each.
Status: Under way.
Contractor: **Williams Brothers Co.**
Completion: January 1, 1959.

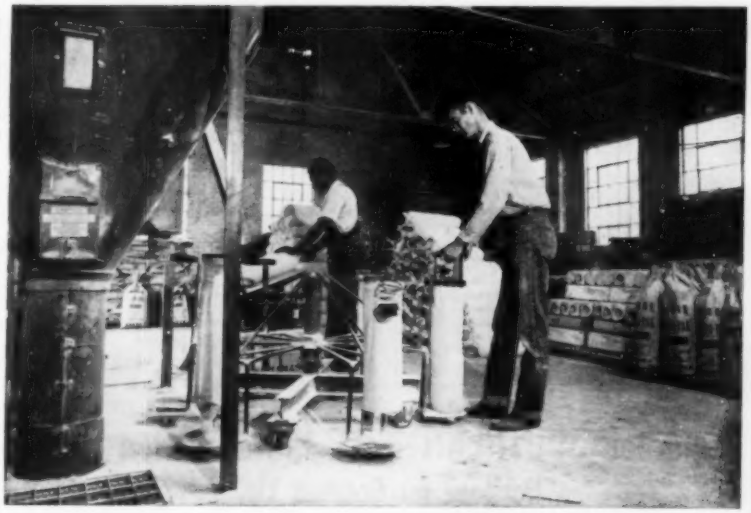
- **Chicago District Pipeline Co.**

Project: 52 miles of 30, 36-in. between Joliet and Chicago, Ill.
Status: Approved by FPC examiners.
Completion: 1958.

- **Cities Service Gas Co.**

Project: 6 miles of 30-in. in Montgomery County, Kansas, and 18 miles of 26-in. in Anderson and Franklin counties, Kansas.
Contractor: **R. H. Fulton & Co.** has the 26-in.

- **Coastal States Gas Producing Co.**



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PIPELINE CONSTRUCTION

Project: A 20-mile gathering system from the Rock Island area of Colorado County, Tex., to the United Gas Corp. system.

• **Coastal States Gas Producing Co. and Southern Coast Corp.**

Project: 45 miles of 2 to 10-in. in Bee County, Tex. to connect presently shutin fields with Texas Eastern Transmission Corp.'s system.

Status: Planned.

• **Coastal Transmission Corp.**

Project: 562 miles of 12, 20, 22, 24-in. main line and 336 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.

Status: Survey and right-of-way work under way.

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Completion: January 1, 1959.

• **Colorado Interstate Gas Co.**

Project: 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pubelo, Colo.; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 24 miles of 22-in. Tex. Panhandle looping.

Status: Approved by FPC examiners. Delayed until 1959.

• **Consolidated Gas Utilities Corp.**

Project: 21 miles of 12-in. and 10 miles of 8-in. at Altus, Okla.

Status: Approved.

• **Eastern Shore Natural Gas Co.**

Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp., in Maryland, across entire length of Delaware to Salisbury.

Status: Approved.

• **El Paso Natural Gas Co.**

Project: 95 miles of 34-in. San Juan main line loops.

Status: Under way. Partially certificated.

Contractor: **R. H. Fulton & Co.** has 28 miles. **Western Pipeline, Inc.,** has 47 miles. Remainder to be let.

Completion: April 1, 1958.

Project: 18 miles of 12-in. between Good Field in Borden Co., and the East Vealmoor gasoline plant in Howard Co., Tex.

Status: Has temporary FPC approval.

Project: 177 miles of 20-in. from Sonora plant, Sutton County, to Plains plant, Yoakum County, Texas.

Status: Planned. Filed for FPC permit.

Completion: July 1, 1958.

Project: 193 miles of 30-in. Permian-San Juan main line loops.

Status: Planned. Filed for FPC permit.

Completion: September 1, 1958.

Project: 216 miles of 6 to 34-in. and 533 miles of various size in Ariz., Tex., N. M.

Status: Filed for FPC permit.

Project: 38 miles of various size line to make additional gas available at the McElroy-Wilshire plant near Crane, Tex.

Project: 500 miles of 34-in. from Twin Falls, Idaho to California border near Las Vegas, Nev.

Status: Planned.

Completion: September 1, 1959.

Project: 59 miles of 20-in. in Crane County, Texas, and 9 miles of various size field lines in Pecos County, Texas.

Status: Filed for FPC approval, February 5, 1958.

• **Equitable Gas Co.**

Project: 12 miles of storage line in Lewis Co., W. Va.

Status: Approved.

• **Gulf Interstate Gas Co.**

Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, Louisiana, and 9 miles of various size field lines in Acadia and Vermilion parishes, Louisiana.

Status: Approved.

Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, Louisiana, and 3 miles of 6-in. loop in Cameron Parish, Louisiana.

Status: Has temporary FPC approval.

Project: 352 miles of 30-in. loop between Louisiana and Leach, Ky.; 54 miles of 24-in. lateral in Louisiana.

Status: Has temporary approval.

Completion: 1959.

• **Houston Texas Gas & Oil Corp.**

Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 139 miles of 18-in. and 101 miles of 20-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's line from McAllen, Tex., to Baton Rouge.

Status: Under way.

Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.

Completion: June 1958.

• **Humble Oil & Refining Co.**

Project: 250 miles of 26 or 30-in. from Southwest Texas area to Houston, plus 200 miles of various size gathering lines.

Status: Planned.

• **Iron Ranges Natural Gas Co.**

Project: 120 miles of 6, 12-in. from Mesabi Iron Range to northern Minn.

Status: Pending FPC approval.

Completion: November 1, 1958.

Project: 63 miles of 12-in. on north shore of Lake Superior.

Status: Pending FPC approval.

Completion: November 1, 1958.

• **Kerr-McGee Oil Industries, Inc.**

Project: 24 miles of 4-in. in Blocks 21, 22, and 32 to connect wells with its Breton Sound production island off the Louisiana coast.

• **Kentucky Gas Transmission Corp.**

Project: 21 miles of 26-in. to parallel its 20, 24-in. lines from its Foster regulating station in Bracken County, Kentucky, to Campbell, Ky.

Status: Filed for FPC approval February 13, 1958.

• **Manufacturers Light & Heat Co.**

Project: 3 miles of 12-in. from Wellsville to a point in Saline Township, Ohio; 8 miles of 12-in. in Brook County, W. Va.; 4 miles of 10-in. in Ohio County, W. Va.

Status: Approved.

• **Michigan Consolidated Gas Co.**

Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.**; Floyd Huduall, supt., office at Cadillac.

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PIPELINE CONSTRUCTION

Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** jointly with **H. L. Gentry Construction,** Frank Morris, superintendent, office at Hart, Mich.
Project: 40 miles of 26-in. from storage fields in Michigan, to Consumers Power Co. distribution system.
Status: Pending FPC approval.

• **Michigan Gas Storage Co.**
Project: 40 miles of 12-in. and 12 miles of gathering lines from Overisal field in Allegan County to Kalamazoo, Mich.
Status: Planned.
Contractor: **Bechtel Corp.**

• **Michigan Wisconsin Pipe Line Co.**
Project: 33 miles of 4, 6-in., 2 miles of 12-in., 4 miles of 10-in., and 7 miles of 8-in. gathering lines in LaVerne Field, Harper County, Okla.
Status: Planned. Pending FPC approval
Completion: October 1, 1958.
Project: 56 miles of 20-in. extension of LaVerne line, Harper County, Okla.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.
Project: 25 miles of 12-in. and 21 miles of 24-in. loops in Wis. and Mich.
Status: Planned. Pending FPC approval.
Completion: October 1, 1958.

• **Midwestern Gas Transmission Co.**
Project: Line from Portland, Tenn., to Minnesota-Canada border near Emerson, Man.: 670 miles of 24-in., 218 miles of 20-in, 371 miles of 16-in., 115 miles of 12-in., 70 miles of 10-in., 179 miles of 8-in., 147 miles of 6-in., 174 miles of 4-in., 106 miles of 3-in.
Status: Pending FPC approval.

• **Mookl Chemical & Gas Corp.** and **Missouri Transmission Corp.**
Project: 425 miles of 16-in. from Pottawatomie County, Okla., to St. Louis. Mookl, 1341 S. Boston, Tulsa, will build Okla. section. Missouri Transmission, Springfield, Mo., will build the Mo. section.
Status: Initial FPC filing rejected. Will refile.

• **Natural Gas Pipeline Co. of America**
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and 91 miles of 30-in. loops along parts of its main line.
Status: Approved by FP Cexaminer. Delayed until 1959.
Project: 337 miles of 30-in. between Fritch, Tex., and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joilet, Ill., along existing system.
Status: Pending FPC approval.
Completion: 1959.

• **New York State Natural Gas Corp.**
Project: Will replace 12 miles of 20-in. with 30-in. and 13 miles of 12-in. with 20-in. in Pa.
Status: Planned.

• **North Carolina Natural Gas Corp.**
Project: 630 miles of 2 to 16-in. from near Mooresville, eastwardly across N. C.
Status: Under way.
Completion: Spring 1958.

• **Northern Natural Gas Co.**
Project: 23 miles of 24-in. loops in Nebr. and Iowa; 43 miles of 30-in. loops in Kans., Nebr., and Iowa; 169 miles of 20-in. from Farmington, Minn., to Superior, Wis.; 44 miles of 16-in. in Duluth-Superior-Iron Ranges area.
Status: Pending FPC approval.
Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher

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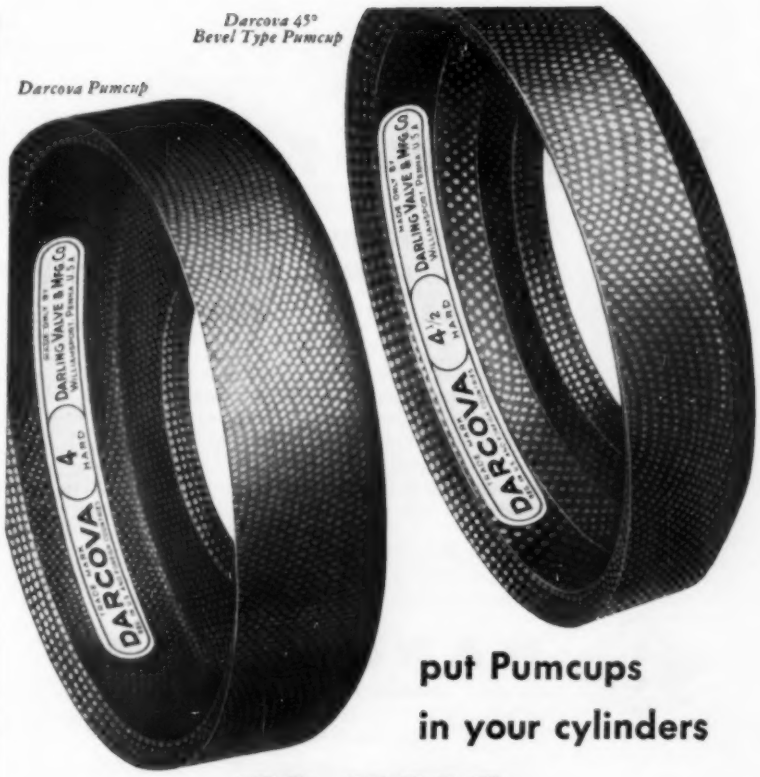

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PIPELINE CONSTRUCTION

Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Proposed.
Project: 1,090 miles of 2 to 16-in. branch lines to serve communities in Minn., Iowa, S. D., Nebr., Wis.
Status: Filed with FPC March 18, 1957.

- **Northern Utilities Co.**

Project: 35 miles of 16-in. in Fremont-Natrona County, Wyoming, area; 8 miles of 12-in. around Casper; 6 miles of 8-in. from Sand Draw gas field to Beaver Creek field; 12 miles of 6-in. from Beaver Creek field to the system servicing the Riverton-Lander area.
Status: Planned.

- **Offshore Gathering Corp.**

Project: 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)
Status: Application pending with FPC.

- **Olin Gas Transmission Corp.**

Project: Mississippi River 3 and 8-in. crossing near White Castle, La.
Status: Under way.
Contractor: **Houston Contracting Co.**, A. J. Slovack and R. E. Thornton, supts., office at White Castle.

- **Pacific Gas & Electric Co.**

Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 8-in. from Corning to Eureka, Calif.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.** and **Alex Robertson Co.**
Completion: June 1958.

- **Pacific Lighting Gas Supply Co.**

Project: 83 miles of 34-in. from North Coles Levee to Newhall, Calif.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Completion: July 1, 1958.

- **Pacific Northwest Pipeline Corp.**

Project: 40-mile line from Ute Trail gas fields in northeastern Utah to its main line in western Colorado.
Status: Planned to start spring 1958.

- **Pennsylvania Gas Co.**

Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa., 30 miles of branch lines, several small distribution lines.
Status: Has FPC permit.

- **Permian Basin Pipeline Co.**

Project: 29 miles of 10-in. gathering lines from Crane and Pecos counties to McCamey, Tex.
Status: Under way.
Contractor: **Lone Star Constructors, Inc.**

- **Piedmont Gas Co.**

Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Has FPC approval.

- **Seaboard Oil Co.**

Project: 6 miles of 10-in. in Vermilion and Lafayette parishes.
Status: Has FPC examiner's approval.

- **Shell Oil Co.**

Project: 9 miles of 6-in. from Lake Pontchartrain to Norco, La.
Status: Planned.

- **Southern Natural Gas Co.**

Project: 335 miles of 4 to 26-in. in southern La.
Status: Pending FPC approval.
Completion: December 1, 1958.
Project: 45 miles of 6 to 10-in. in southern La.
Status: Pending FPC approval.
Completion: December 1, 1958.
Project: 42-mile gathering system in Plaquemines and St. Bernard parishes, south of New Orleans: 10 miles of 4-in.; 9 miles of

PIPELINE CONSTRUCTION

6-in.; 5 miles of 8-in.; 8 miles of 10-in.; 10 miles of 12-in.

Status: Under way.

Contractor: **Houston Contracting Co.**

Completion: May 1, 1958.

Project: 45 miles of various size supply laterals in Louisiana.

Status: Filed for FPC approval February 12, 1958.

Project: 1,200 miles of pipe from about 35 fields in southern Louisiana.

Status: Pending FPC approval.

Project: 25 miles of 6 to 20-in. in southern La.

Status: Pending FPC approval.

Completion: December 1, 1958.

- **Tennessee Gas Transmission Co.**

Project: 556 miles of 30-in. from Mississippi Delta area south of New Orleans to Portland, Tenn.

Status: Has temporary FPC approval.

Project: 76 miles of 24-in. from Coudersport, Pa., to Hamburg, N. Y.

Status: Has temporary FPC approval.

Project: 163 miles of 30-in. and 101 miles of 26-in. from Portland, Tenn., to near Lancaster, Ky.; from Winchester, Ky., to Morehead, Ky.; from Catlettsburg, Ky., toward Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from Morehead, Ky., to Catlettsburg, Ky.

Status: Has Temporary FPC approval.

- **Texas Eastern Transmission Corp.**

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

Project: 140 miles of 30-in. between Kosciusko, Miss., and Uniontown, Pa., 105 miles of 30-in. between Opelousas, La., and Kosciusko, 22 miles of 14-in. supply line in La.

Status: Pending FPC approval.

- **Texas Illinois Natural Gas Pipeline Co.**

Project: 860 miles of 30-in. looping of present system.

Status: Planned.

Completion: 1960-1961.

- **Transcontinental Gas Pipe Line Corp.**

Project: 202 miles of 36-in. and 132 miles of 30-in. main line loop; 164 miles of 24-in. to connect storage in Pa.; 202 miles of 10 to 20-in. gathering lines in southeast La.; 48 miles of 10 to 20-in. to tap gas off Tex.

Status: Pending FPC approval.

Project: 57 miles of 36-in. main line loop.

Status: Pending FPC approval. Planned for 1959.

Project: 87 miles of 24-in. laterals, plus small gathering lines connecting seven Louisiana fields with the New Orleans area.

Status: Pending FPC approval.

- **Transwestern Pipe Line Co.** (Warren Petroleum, Monterey Oil Co.; J. R. Butler).

Project: A line from W. Tex. area to Calif. border.

Status: Proposed.

- **United Gas Pipe Line Co.**

Project: 18 miles of 12-in. from Lirette-Mobile line in Jackson County, south to Bayou Casottee industrial area east of Pascagoula, Miss.

Status: Approved.

Contractor: **Houston Contracting Co.**, L. A. Young, supt., office at Moss Point, Miss.

Project: 202 miles of 30-in. loop from southeast Louisiana, to Mobile, Ala.

Status: Pending FPC approval.

Canadian Crude-Oil Pipelines

- **Act Oils, Ltd.**

Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Bella Coola, B. C.

Status: Request has been made for permit from the B. C. government.

- **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

- **Bituminous Oil Pipeline Co.** (Royalite Oil Co. and Can-Amera Oilsands Development, Ltd.)

Project: 250-mile line from Athabasca oil sands in northeastern Alta., to Edmonton.

Status: Long-range plans.

Completion: 1960.

- **East Coast Transmission Co.** (Pacific Petroleums, Ltd., Home Oil, Ltd., Canadian Homestead Oil, Ltd., Merrill Petroleums, Ltd.)

Project: Line from Alberta to Montreal.

Status: Proposed.

- **Gibson Petroleum Co., Ltd.**

Project: 25 miles of line from Willesden Green field to near Rimbley, Alta.

Status: Has Alberta Government approval.

- **Interprovincial Pipe Line Co.**

Project: 82 miles of 24-in. loops in Alta. and Sask.

Status: Planned.

Contractor: **Piggott Construction, Ltd.**, Edmonton, Alta.

- **Westcoast Transmission Co., Ltd.**

Project: Line to parallel its 650-mile, 30-in. gas line from Peace River to Vancouver, B. C.

Status: Under study.

- **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.

Status: Has requested permit from Board of Transport Commissioners.

Contractor: **Majestic Contractors, Ltd.**, Jeff Minter, supt., office in Estevan, Sask.

Completion: No date set.

Canadian Products Pipelines

- **Hydrocarbons Pipeline Co.**

Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.

Status: Has permit from Parliament of Canada. Seeking approval by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.

Construction consultants: **Dutton-Williams Brothers, Ltd.**, and **A. D. Little Co.**

Canadian Natural-Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.

Status: Under way.

Contractor: **Dutton - Williams Brothers, Ltd.**, has preliminary studies, design and management - engineering. **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.**, has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress. **Fulton Banister, Ltd.**, has completed 17 miles of 34-in. west from Burstall, Sask., to near Cavendish, Alta., and 100 miles of 18-in. north to Bindless and Provost fields.

- **Alberta & Southern Transmission Co., Ltd.**

Project: 1,300 miles of 36-in. from Alberta to San Francisco area plus 47 miles of gathering lines.

Status: Planned

Completion: 1960.

- **Canadian Western Natural Gas Co., Ltd.**

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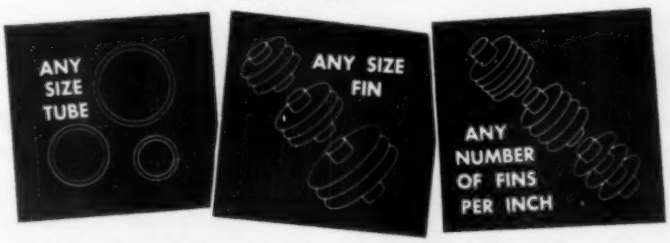

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PIPELINE CONSTRUCTION

Project: 58 miles of 16-in. from Carbon field to Calgary, Alta.

Status: Proposed. Pending approval of Alberta Oil and Gas Conservation Board.

• **Northern Ontario Pipe Line Crown Corp.**

Project: 675 miles of 30-in. from the Ontario-Manitoba border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line; will be leased to Trans-Canada Pipe Line Co. with option to buy). 360 miles from Port Arthur to Kapuskasing remains to be laid in 1958.

Status: Under way.

Contractor: **Nelen, Ltd.; Majestic Contractors, Ltd.; B. C. River Construction, Ltd.,** has 91 miles from Longlac to Hurst, E. L. Maggard, supt., office at Longlac, to complete October 1; **Mannix, Ltd.,** has 92 miles from 35 miles west of Hearst, Ont., to Kapuskasing, Odis Hare, supt., office at Hearst; **Morrison Shivers, Ltd.**

Completion: November 1958.

• **Northwestern Utilities, Ltd.**

Project: 72 miles of 16-in. from Pembina field to Edmonton, Alta., and 47 miles of 4 to 16-in. gathering lines.

Status: Under way.

Contractor: **Mannix, Ltd.,** has 45 miles of main line, plus the gathering system and the North Saskatchewan River crossing, S. Steffen, supt. of gathering system activities, office at Drayton Valley.

Completion: 1958.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 491 miles of 30-in. from Kapuskasing to Toronto.

Contractors: Starting at Kapuskasing and going toward Toronto, **Grayco Contractors, Inc.,** has 82 miles; **Majestic Contractors, Ltd.,** has 83 miles; **Dutton-Williams Brothers, Ltd.,** has 57 miles; **Canadian Bechtel, Ltd.,** has 47 miles from Rib Lake to Tilden Lake, H. F. (Hank) Mogg, general supt., office at Timagami; **Morrison-Shivers, Ltd.,** has 62 miles; **H. C. Price Co.** and **Poole Construction Co.** has 63 miles; **Oklahoma Pipe Line Constructors** has 92 miles.

Completion: October 1, 1958.

• **Westcoast Transmission Co., Ltd.**

Project: 42 miles of 20-in. and 100 miles of 30 in. from Savanna Creek area, Alta., to Canadian-Idaho border.

Status: Planned.

Completion: November 1, 1958.

Project: Looping of present system to double capacity.

Status: Planned.

Project: 80 miles of 8, 10, 12, 18, 20-in. extension of gathering system along Alaska Highway in Northeastern B. C.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.,** Doyle Cook, asst. supt., office at Dawson Creek.

Completion: August 1958.

Foreign Crude-Oil Pipelines

• **Arabian American Oil Co.**

Project: 9 miles of 32-in. loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1960.

Project: 17 miles of 32-in. extension of loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1961.

Project: 9 miles of 30-in. extension of loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1960.

Project: 12 miles of 30-in. extension of loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1961.

Project: 54 miles of 30-in. loop of Safaniya-Ras Tanura line.

Status: Planned.

Completion: January 1959.

Project: 63 miles of 30 and 32-in. from Khursaniyah to Ras Tanura.

Status: Planned.

Completion: January 1960.

• **Assam Oil Co.**

Project: 600 miles of 20-in. from Nahorkatiya field in Upper Assam to Barauni, India, to connect with Burmah Oil Co.'s proposed 250-mile line from Barauni to Calcutta.

Status: Survey of possible routes under way.

Contractor: **Pipe Line Engineering Co.** is making survey.

• **Bolivia-Paraguay.**

Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.

Status: Planned .

Contractor: **Five Lilles,** a French Combine.

• **Burmah Oil Co., Ltd.**

Project: 250 miles of 20-in. from Barauni to Calcutta, India, extending Assam Oil Co.'s proposed line.

Status: Survey under way.

Contractor: **Collins Construction Co.** is surveying locations for some 40 river crossings.

• **Caltex**

Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line will be extended 35 miles to Minas field later.

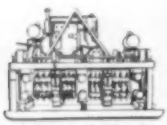
Status: Under way.

Contractor: **Bechtel Corp.**

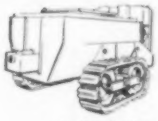
Completion: May 1958.

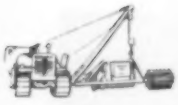
• **Cia. Shell de Venezuela**

Project: 34 miles of 16-in. from Boscan


stationary cleaning & priming machine

pipeline cradles


pipeline kettles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internal line up clamp

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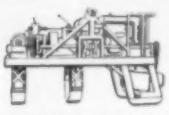
pipe cutting & beveling machine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PIPELINE CONSTRUCTION

to site of a planned terminal at Puerto Miranda Venezuela.

Status: Planned.

Contractor: **Williams Brothers Sudamericano, Ltd.**

- **Colombian Petroleum Co.**

Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.

Status: Under way.

- **C.R.E.P.S., Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), and Cie. Francaise des Petroles Algerie**

Project: 450 miles of 16-in. from Edjele field in southeastern Algeria to a Mediterranean port on the Libyan coast.

Status: Pipe has been ordered.

- **Creole Petroleum Corp.**

Project: 100 miles of 30-in. from Temblador field to Caripito in Venezuela.

Status:Under way.

Contractor: **Pipe Line Engineering Co.** and **Oklahoma Pipe Line Constructors**, R. J. O'Connell, supt., office at Maturin.

Completion: April 30, 1958.

- **Elburz Oil Corp.**

Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.

Status: Planned.

- **Iranian Oil Participants, Ltd.**

Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bandar Mashur line.

Status: Planned.

Project: 50 miles of 26, 28-in. from Gach Saran field to new terminal at Kharg Island in the Persian Gulf.

Status: Planned.

Contractor: A joint venture of **Raymond Concrete Pile Co.** and **Williams Brothers Co.** of Tulsa; **Richard Costain, Ltd.,** and **John Brown, Ltd.,** of Britain; **Werkspoor & Bredoro** of The Netherlands.

- **Iraq Petroleum Co.**

Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq to Turkish port of Iskenderun on the Mediterranean.

Status: Proposed. Survey completed.

- **Mene Grande Oil Co.**

Project: 97 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.

Status: Under way.

Contractor: **Fulghum Contracting Corp.** has 22 miles between Oficina and Anaco. **Williams Brothers Co.** has remainder.

Completion: First quarter 1958.

Project: 45 miles of 24-in. from Oficina to Melones, Venezuela.

Status: Planned.

Completion: First quarter 1958.

- **Middle East Pipeline**

Project: 1,500 miles of 38 and 40-in. line from Persian Gulf to Mediterranean at Iskenderun, Turkey.

Status: Proposed.

- **North-West Oil Pipeline Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 230 miles of 28-in. from refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.

Status: Work to start early 1958.

Contractor: **W. M. Lyles** in joint venture with two German steel firms.

Completion: November 1958.

- **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, Netherlands, and Belgium. Main trunk to be 30-in.

Status: Company is considering project together with several other companies.

- **SOPEG** (Cie. Francaise de Petrole (Algerie) and Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie)

Project: 300 miles of 24-in. from Hassi Messaoud field in the Algerian Desert to Bougie on the Mediterranean Coast.

Status: To start fall 1958.

Contractor: **Entrepose Co.** jointly with **Ste. Parisienne pour Industrie Electrique.**

Completion: 1959.

- **Union of Soviet Socialist Republic**

Project: 2,300-mile Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

- **Yacimientos Petroliferos Fiscales** (Argentina)

Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.

Status: Planned.

Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.)

Project: 625 miles of 12-in. from Mendoza to San Lorenzo.

Status: To start 1st quarter 1958.

Completion: Mid-1960.

Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blanca on the coast.

Status: Bids requested.

- **Yacimientos Petroliferos Fiscales Bolivianos**

Project: 174 miles of 10-in. and 44 miles of 8-in. from Sicasica, Bolivia, to Arica, Chile.

Status: Planned.

Contractor: **Williams Brothers Co.** and **Telescopic Pipe Line.**

Completion: October 1958.

Foreign Products Pipelines

- **Empresa Nacional de Petroles** Government of Chile and Cia de Petroles de-Chile (Copec), et al.

Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.

Status: Under way.

Contractor: **Williams Brothers.**

Completion: 1958.

- **National Iranian Oil Co.**

Project: 90 miles of 12-in. from Abadan to Ahwaz, Iran.

Status: To start spring 1958.

Contractor: **Entrepose Co.,** Paris.

Completion: Summer 1958.

- **North Atlantic Treaty Organization**

Project: 2,000 miles of lines to airfields in parts of Europe.

Status: Under way.

Contractor: **Associated Pipeline Contractors, Inc.** (450 miles from Iskenderun, Turkey, to Batman); **TECHINT** (205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir).

"Joe has a slight impediment in his speech—he has to stop to breathe."

Foreign Natural-Gas Pipelines

- **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

- **City of Riyadh, Saudi Arabia**

Project: 182 miles of 10-in. from Ghawar field to Riyadh.

Status: Planned.

- **Cuban Gas Transmission Co.**

Project: 650-mile pipeline from Campeche area of Mexico across Yucatan and on the ocean floor to Havana, Cuba; 150 miles would be submarine.

Status: Being studied by Ebasco Services.

- **Gaz de France**

Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. terminal to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.

Status: Under way.

Contractor: French contractors.

Completion: First stage in 1958; complete system in 1960.

- **NIOGAS**

Project: 160 miles of 6, 8, 10, and 12-in. from Fischamend field to Vienna and other Austrian cities.

Status: Under way.

Contractor: **Williams Brothers Co.** and **Costain-John Brown, Ltd.**

Completion: Fall 1958.

- **North Thames Gas Board**

Project: Will extend its Shellhaven-to-Romford line to Coryton then to Canvey Island.

Status: Planned.

Completion: Summer 1958.

- **Petroleos Mexicanos.**

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.

- **Sui Gas Transmission Co.**

Project: 310 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.

Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.

Project: 145-mile line from Sylhet to Dacca, East Pakistan.

Status: Under consideration. If approved construction could start December 1958.

- **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venzuela.**

Project: 207 miles of 26-in. from Anaco fields to Caracas.

Status: Under way.

Contractor: **Williams Brothers Co.** has part.

Completion: Spring 1959

- **Union of Soviet Socialist Republic.**

Project: 808 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow, to serve Voroshilovgrad, Voronezh, Tula, Yelets, and Serpukhov.

- **Yacimientos Petroliferos Fiscales** (Argentina)

Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.

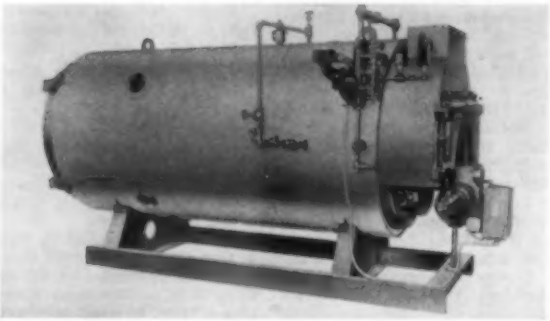
Status: To start first quarter 1958.

Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.)

Completion: Mid-1960.

SHOWCASE...

NEW EQUIPMENT



Packaged boiler-burner unit available

Factory assembled, the boiler-burner unit is suited for gas, oil, or combination gas-oil firing. It's available in eight high-pressure sizes—from 125 to 150 psi. steam working pressure and 18 to 92 hp.—and eight low-pressure sizes—15 lb. steam or 30 lb. water and 606,000 to 3,060,000 B.t.u. per hour.

Completely automatic forced-draft firing is employed. Only a vent pipe is needed, regardless of boiler-room location or atmospheric conditions. Units may be ordered completely assembled—with burner, blower, controls, fittings, and trim in place—and fire-tested at the factory. The boiler can be obtained first and the burner at a later date for field mounting.

Burner features include complete carbureting of No. 5 oil or lighter and, on combination gas-oil firing, quick fuel changeover by simple valve control. Boiler features include cast iron, insulated flue doors and 3-in. fire tubes set with roller expander and beaded on each end. All boiler materials and construction comply with specifications of ASME code. The burner is listed by Underwriters' Laboratories, Inc. **Write or call: Kewanee Boiler Div., American Standard, 101 Franklin Street, Kewanee, Ill., for details on package boiler-burner.**

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Described in OIL AND GAS JOURNAL - Issue of March 17, 1958

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ADDRESS.....

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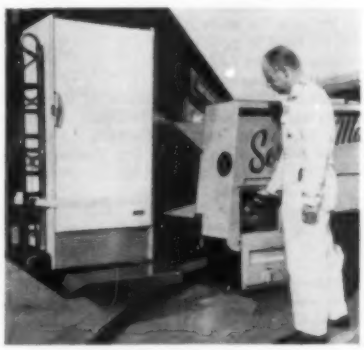
DATE.....

Hydraulic Tail Gate Fits Pickup Trucks

Easier loading and unloading is offered by the elevating tail gate. Known as the Weight Lifter, it is a powered model that mounts underneath a pickup to the truck frame with four bolts. No protrusions or posts extend above the truck body.

It is 12 or 6-volt battery electric-hydraulic powered. The reservoir, pump, valve, and control switch are in one unit. The control mounts conveniently on the side of the truck body. The tail gate has an 800-lb. lifting capacity. According to the maker, it lifts this load in five seconds.



A safety switch stops the load the moment the operator takes his hand off the control lever. A "sneakproof" valve holds the gate at any desired height or in a rigid, vertical, closed position during transport. The unit lists for $360 f.o.b. factory. **Write or call: H. S. Watson Co., 1316 Sixty-Seventh Street, Emeryville, 8, Calif., for details on Weight Lifter tail gate.**

●

New Solvent Cuts Paraffin From Wells

Called Visco 958, the new paraffin solvent is an oil-soluble liquid that's said to be free of chlorine so it won't introduce chlorine into refinery feed stocks. It can be useful in oil production to remove paraffin from producing wells, flow lines, and storage tanks. Solvent action is made efficient by use of semipolar surfactants.

The maker says Visco 958 will normally loosen and dissolve stubborn paraffin blocks without the use of

heat. It is shipped in 55-gal. steel drums. **Write or call: Visco Products Co., Inc., 1020 Holcombe Boulevard, Houston 25, for details on Visco 958 paraffin solvent.**

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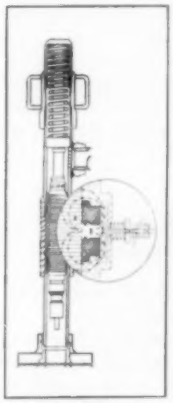
Lubricator-Controller Has Magnetic-Trip Action



The magnetic-tripping device in the new system replaces one used previously which was mechanical. It eliminates the need for openings, protrusions, or movable seals in the lubricator, the maker reports. The device may be useful in both oil and gas wells.

With the new system, a balanced-magnetic circuit is interrupted when the plunger enters the lubricator. This triggers a pilot valve which closes the controller and shuts down the flow-line motor valve instantly. **Write or call: Harold Brown Co., Houston, for details on plunger-lubricator-controller system.**

•

Paraffin Removers Free of Chloride

Tradenamed Solvo, the new paraffin removers are free of organic chlorides, the maker says. They are organic liquids. Most are dispersible in both oil and water. Thus they can be used in either diluent. Their high flash points and low vapor pressures make them safe to use, the maker adds.

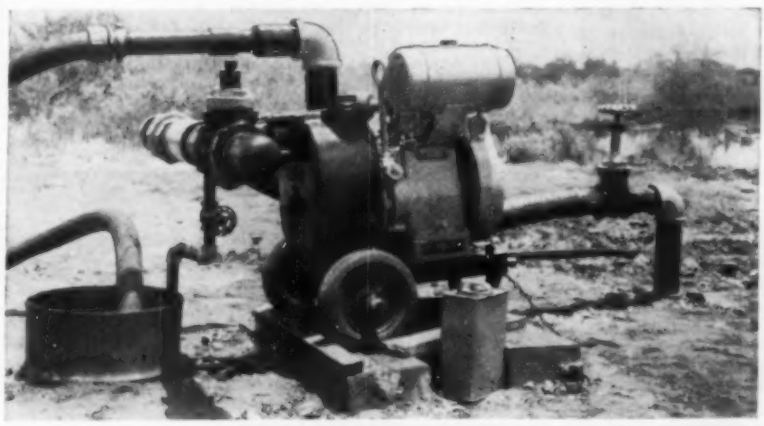
The paraffin removers can be used as both correctives and preventives. They are equally effective when used to remove paraffin deposits from pumping wells, flowing wells, flowlines, or storage tanks. When applied to clean, paraffin-free systems, they prevent paraffin deposits.

Their chloride-free formulation is expected to be particularly important to refiners who process crude petroleum subjected to paraffin-removal treatment. The reason is that organic chlorides, when used in paraffin removers, remain in the crude oil going to the refinery and adversely affect the performance of platinum catalysts used in catalytic reforming. **Write or call: Tretolite Co., 369 Marshall Avenue, St. Louis 19, for details on Solvo paraffin removers.**

Plastic Sign Applied Easily to Equipment

Even in cold weather the sign can be put on without wetting. To apply the new vinyl-plastic sign, just strip off its backing and press it on, the maker reports. The sign transfer makes an easy way to place company identification on vehicles and equipment. The sign is called Rubbercal.

The vinyl film of a Rubbercal emblem is tough and it has a strong pressure-sensitive adhesive designed for firm adherence to metal, glass, painted wood, and other nonporous surfaces, according to the maker. It is flexible and readily molded to contoured shapes. And it stays firm-



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DUAL PRIME PUMPS

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• These pumps are especially built for oil field service in a large variety of sizes and models. Each Dual Primer is a compact, ready-to-run unit that can be used for either suction lift or booster pumping. Write for latest Pump Bulletin.

CONSTRUCTION MACHINERY COMPANY, Waterloo, Iowa

Pictured above & below, CMC Model 37-N on a typical oil field gathering operation.

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MACCO NORMALLY CLOSED CHECK VALVE

The Macco normally closed, positive, dual seating check valve represents one of the major developments in the evolution of gas lift equipment. It is a 10,000 p.s.i. test, 5,000 p.s.i. working pressure valve which is manufactured with standard ½" pipe thread connections for installation wherever a fine heavy-duty, dependable check valve is required. Their patented design makes them particularly resistant to the ill effects of abrasive erosion and acid.

Installed on Macco gas lift valves this check valve positively prevents back flow of fluid from the tubing to the casing. They also make it possible to acidize the formation or back-pressure the tubing without exposing the casing to either acid or extreme pressures. A scientifically designed hollow "float" allows all of the gas or fluid which passes through the check valve to pass through the lateral openings and hollow stem. This feature provides protection for the spring. Macco check valves are dual seating—first, a metal shoulder on a "resinoid" disc and also metal-to-metal under high pressure.

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253

› all types of
REFINERY
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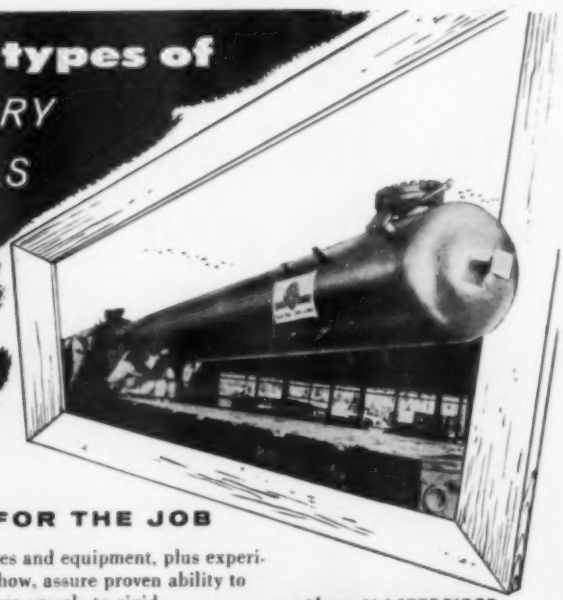

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Master's facilities and equipment, plus experience and know-how, assure proven ability to fabricate pressure vessels to rigid engineering specifications. Write — wire — phone MASTER *FIRST* for the finest in steel fabrication.

another MASTERPIECE *fitted for the* JOB

Master also produces API 5LX HI-TEST Expanded Line Pipe

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SHOWCASE . . .

New Equipment

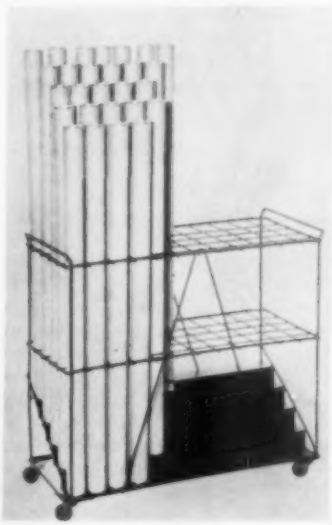
ly affixed until removal is desired. Then it can be stripped clean and thereby save the cost of sanding or grinding an emblem off.

Easily transferred outdoors, the sign withstands weather extremes and gravel and road oils. Plastic paints are used in creating the designs. They become part of the film, resulting in a long-lifed emblem. **Write or call: Multi-Color Process Co., 319-325 South Quincy, Tulsa, for details on Rubbercals.**

●

Steel Map Rack Has Different Levels

The steel map racks make map identification easy and provide an improvement in storage efficiency, the maker says. They are of lightweight construction, spot-welded throughout, and mounted on ball-bearing casters. Each map rack can be a complete department in itself.



Three models have 30, 60, or 100 openings with a 2½-in. capacity. The largest map rack has 36 openings. Diameter of each opening is 3½ in. To make map identification easy, graduated steps put the maps on different levels.

Kraft-wrapped tubes with metal ends protect the maps. A 6-in. telescope cap tops each tube. It can be labeled and indexed. Made in 43 and 55-in. lengths, all tubes are treated inside to preserve maps. **Write or call: Frontier Mfg. Co., P. O. Box 13266, 11200 Harry Hines Boulevard, Dallas, for details on map racks.**

With Magcobar on your well ...

you get full laboratory backing wherever you drill

"Get this sample to the laboratory as fast as possible." And by fast plane or car, the mud sample, packed in an air-tight stainless steel container, is rushed to the Magcobar laboratory. The laboratory works on a 24-hour basis when the emergency is your well. You get the precise information needed to keep drilling.

In many problem wells there is simply no way of obtaining the data needed for proper action at the well site. For example, you can't check for all chemical ions by simple titration, but with the spectrophotometer the right answer can be arrived at in minutes. In the laboratory complete chemical analyses of the mud can be made quickly and the physical properties studied at various pressures and temperatures.

This is the emergency work the laboratory does, backing up and supporting the field engineer. Just as important is its day in and day out job of developing new drilling chemicals, evaluating their effectiveness in the field, helping you in many ways to cut drilling costs through an engineered mud program.

Wherever you drill you benefit from the Magcobar Laboratories. So, make sure you get the best. Plan with Magcobar on your next well.

Magnet Cove Barium Corporation
Houston, Texas

Magcobar®
Complete
DRILLING MUD SERVICE

58—102

JOHN FREDD,
OTIS DESIGN ENGINEER,
DISCUSSES NEW
DEVELOPMENTS OF THE
OTIS SURFACE CALIPER

"How can thin-walled joints be detected before tubing is run in a corrosive, high-pressure well?"

A. The best way is to run an Otis "Surface" Caliper survey to determine any loss in wall thickness . . . in either new or used tubing.

Q. John, you said new tubing; isn't the wall thickness in new pipe full-gauge?

A. By no means. Many times, we have made Otis tubing corrosion surveys and found a general loss in wall thickness . . . not due to corrosion, but rather to "original mill deviations."

Q. Is that bad?

A. It's bad if you run one of those weak joints in a high-pressure well. But you can avoid that by calipering the pipe on the rack — *before* it is run. And this can be done on the location, or in the pipe yard . . . and also to grade used tubing.

Q. What is usually done after the pipe is graded?

A. Tubing can be run into high-pressure wells if it is in good shape. Other grades can be used in pumping wells, or for line pipe, for structural purposes, or junked — all according to its grade.

Q. Why is the Otis service superior?

A. For one thing, we have a permanent, strip-chart to document our grading of each joint. There is no "visual" estimation nor guesswork; the Otis Caliper measures the actual, internal condition of the pipe. Too, we have calipered more pipe — millions of feet in fact — than any other service company.

Q. How does the instrument work?

A. As the caliper is drawn through the joint, the feelers contact the inside wall of the pipe. As a corrosion pit is encountered, direct action of any one of the feelers causes an electrical signal to be transmitted to the strip-chart recorder. Thus the internal condition is recorded immediately, and we can color-code and classify each joint accordingly.

Q. What if the inside of the pipe is heavily scaled?

A. Well, although the feelers will probe through all but the very hardest deposits, we can also clean the tubing, using an air motor and a wire brush in a combination operation—cleaning in one direction, and calipering on the return trip.

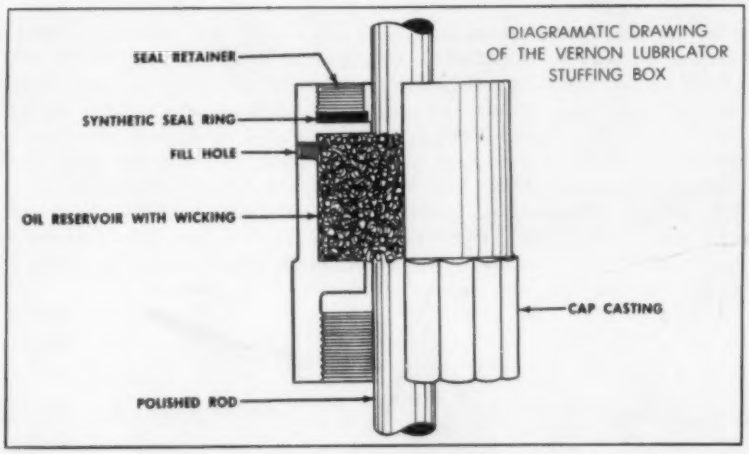
Q. Does this cleaning time slow you down?

A. Not too much; it usually takes from 1 to 1½ minutes to clean, and 30 seconds to caliper. Thus we can average from 20 to 30 joints per hour.

Q. Is this "Surface" Caliper service available now?

A. Indeed it is — from any of our Branches Throughout the Oil Country. We can do a survey for you today, if you want us to.

OTIS Engineering
CORPORATION
BRANCHES THROUGHOUT THE OIL COUNTRY



DIAGRAMATIC DRAWING OF THE VERNON LUBRICATOR STUFFING BOX

Stuffing box gives extra lubrication

The stuffing box is designed for wells that occasionally pump dry or need additional lubrication. It is of the same design as the Vernon Standard and Pack-Off fluid-sealed stuffing boxes. It's available in either type. One feature of the new lubricator type of stuffing box is simple construction.

A chamber in the cap is packed with absorbent wicking. Upon installation, this chamber is filled with oil. It may be readily refilled—through a convenient fill connection—as needed.

The oil-saturated wicking keeps the polished rod lubricated. A wiper ring is built into the top of the cap to keep lubricant in and dirt out. **Write or call: Vernon Tool Co., Ltd., 1101 Meridian Avenue, Alhambra, Calif., for Bulletin SB-8.**

Slide Rule Built For Microwave Systems

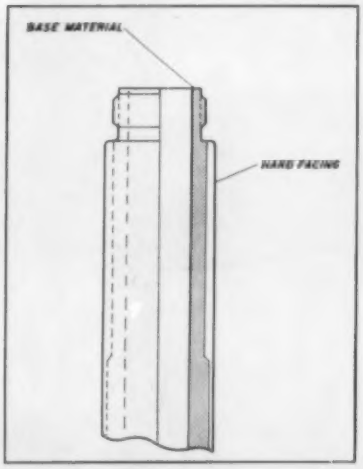
Such calculations as path loss, antenna gain, fade margin, carrier-to-noise ratio, and other mathematical manipulations required to plan a microwave-communications system are made easier with the slide rule's 28 scales.

One side of the rule is used to calculate propagation characteristics over a range of microwave frequencies from 1,000 to 30,000 MC. Included are Fresnel zone clearance, path loss, antenna and reflector gain, beam width, and other path parameter needed for system design.

On the reverse side are scales for multiplex calculations, including signal-to-noise ratio, carrier loading, and all other related factors for both FM and single-sideband multiplex-system performance calculation. **Write or call: Motorola Communications and Electronics, Inc., Microwave and Industrial Control Dept., 1400 North Cicero Avenue, Chicago 51, for details on microwave-system slide rule.**

Pump Plunger Protected By Hard Face

The new subsurface pump-plunger facing is almost as hard as a diamond. It resists abrasion and will not gall, the maker reports. It's designed for use in wells with extremely abrasive and corrosive conditions.



The plunger surface is composed of hard carbide and boride particles. A nickel binder holds them together. These particles have a hardness of 9 on the Mohs scale—diamonds have a hardness of 10.

The material is highly resistant to corrosion, impervious to salt water, and extremely resistant to hydrogen sulfide, the maker says. Its low coefficient of friction provides high resistance to galling. **Write or call: Axelson Mfg. Co., Div. of U. S. Industries, Inc., 5947 Sheila Street, Los Angles 22, for details on Axite plunger surface.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in *OIL AND GAS JOURNAL - Issue of March 17, 1958

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COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

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*Office only. No stock at these points.

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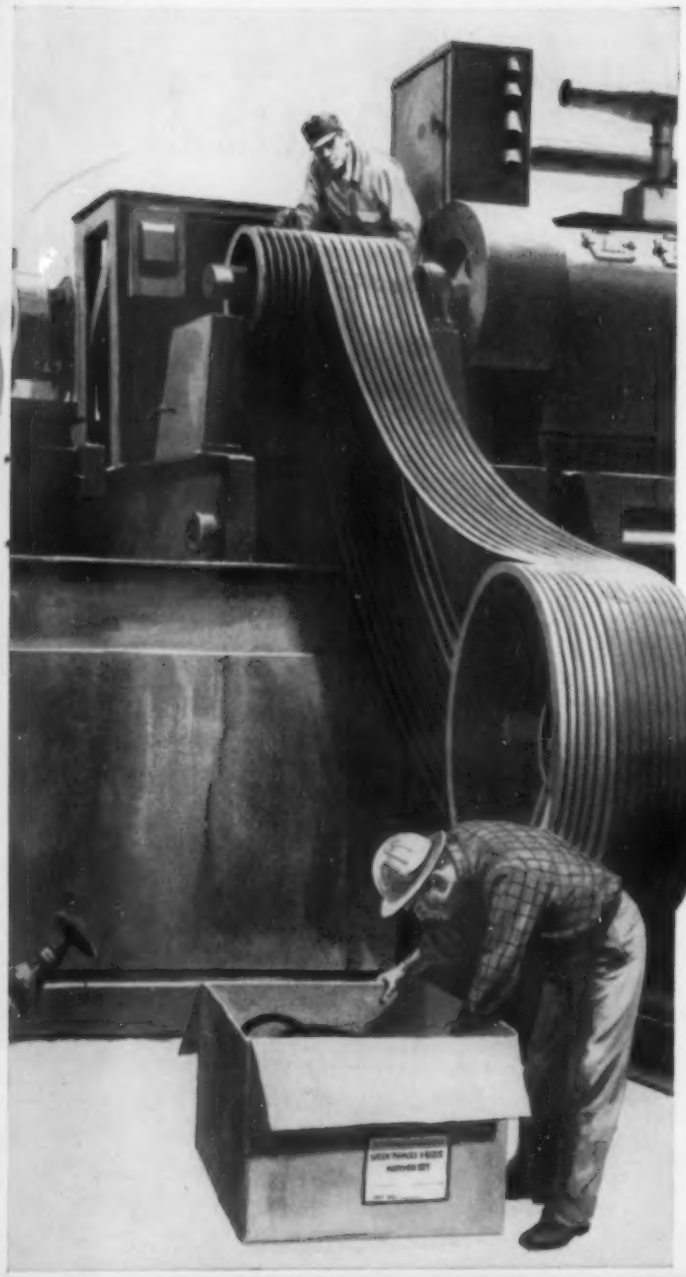

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GREEN TRIANGLE V-BELT

Why gamble on "general purpose" V-belts when GREEN TRIANGLE V-belts . . . designed exclusively to meet rugged oil country use . . . are available from your Continental-Emsco stores?

Here are belts in matched sets, engineered for continuous operation . . . belts that will withstand the heat and abrasive sands of Saudi Arabia, the salt sprays of the Gulf and the deep freeze of Canada.

Increase V-belt life with a call to your Continental-Emsco man and ask for *oil field tough* GREEN TRIANGLE V-belts . . . manufactured by the New York Belting and Packing Company and distributed throughout the world's oil fields by Continental-Emsco.

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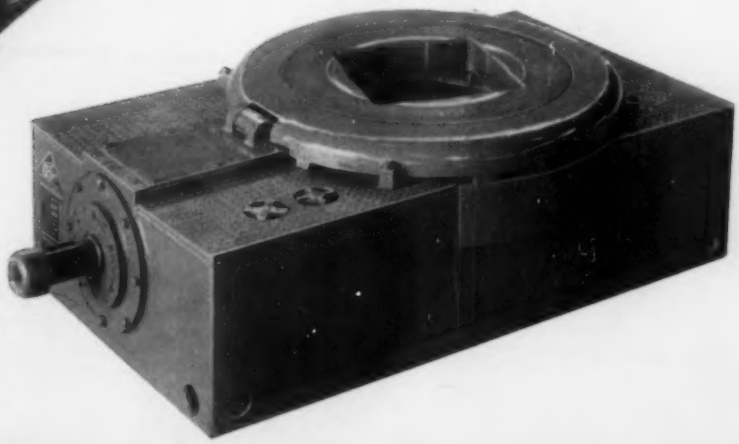
THESE QUALITY ITEMS RED

Today's drilling demands modern design

CONTINENTAL-EMSCO
Swivels and Rotary Tables

C-E swivels and rotary tables are heavy-duty accessories that work hand-in-hand for faster, high-pressure drilling. They are designed to handle all the demands created by modern drilling . . . longer, heavier drill pipe strings . . . higher mud circulating pressures . . . more drill collars . . . faster trips.

You can depend on C-E swivels and rotary tables to work harder, last longer and require less maintenance. Let your Continental-Emsco man show you how these accessories can help you make more hole . . . and more profit.



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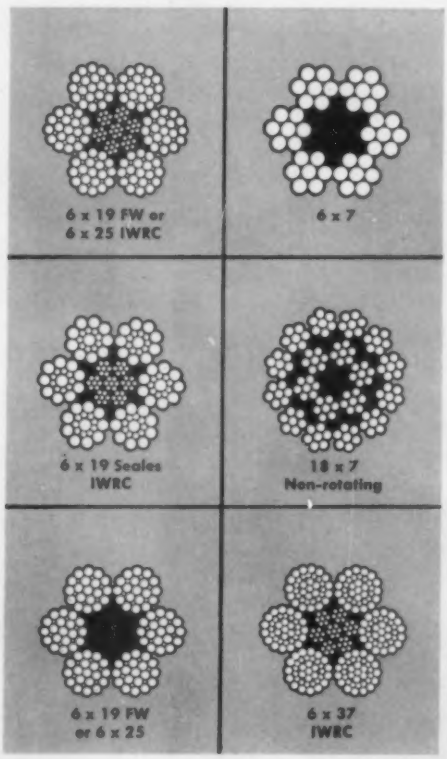
DUCE DRILLING DOWNTIME

Standardize on

Yellow Strand®

"POWERSTEEL"



If you need a wire line *today* . . . *tomorrow's* too late. That's why it pays to standardize on Yellow Strand . . . the oil country's most dependable wire rope that's *in stock every day* at your nearby Continental-Emsco store.

Store stocks are backed up by Broderick & Bascom warehouses at Peoria, Houston, New Orleans, St. Louis, Seattle and Los Angeles. You can be assured that the size, construction and grade of rope you standardize on will be ready for immediate delivery at all times.

Discuss wire rope with our store people and select the grade and size that will give the longest wire line life possible for your money.

for Service

SUPPLIES AND SERVICE

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Drilling Masts

the preferred mast for land or marine rigs

Portability and ***ruggedness*** . . . the features most preferred by contractors and drillers . . . have been designed and built into the new Continental-Emsco B-Series masts. In addition, the open face mast design provides greater block clearance for faster, safer block travel, and unimpaired visibility.

Faster erection is now possible with these *field proven* features: (1) rear leg pivot and ground level assembly; (2) simplified pin connections for all mast sections; and (3) positive line control during raising and lowering, eliminating the need for snubbing lines.

Positive line control also makes these masts ideally suited for barge installations, since they can be quickly lowered . . . ***without snubbing lines*** . . . when approaching over-water obstacles . . . or when severe weather sets in.

Discuss your drilling mast requirements with your Continental-Emsco man.

Sizes: B-127, B-133, B-134 and B-142.

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"Jim . . pick out the kind and size you want"

This tool pusher knows that at Continental-Emsco he'll find a wide selection of sizes, types and designs of everything he needs. This wide variety of products saves his time by making *one-stop buying* possible. And he also knows he'll receive prompt, *personalized service* from our store people and continuous follow up and checking of factory shipments.

Don't neglect the advantages of *. . in person buying . .* at your nearby Continental-Emsco store.

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Make visiting your Continental-Emsco store a regular habit when you're in town.

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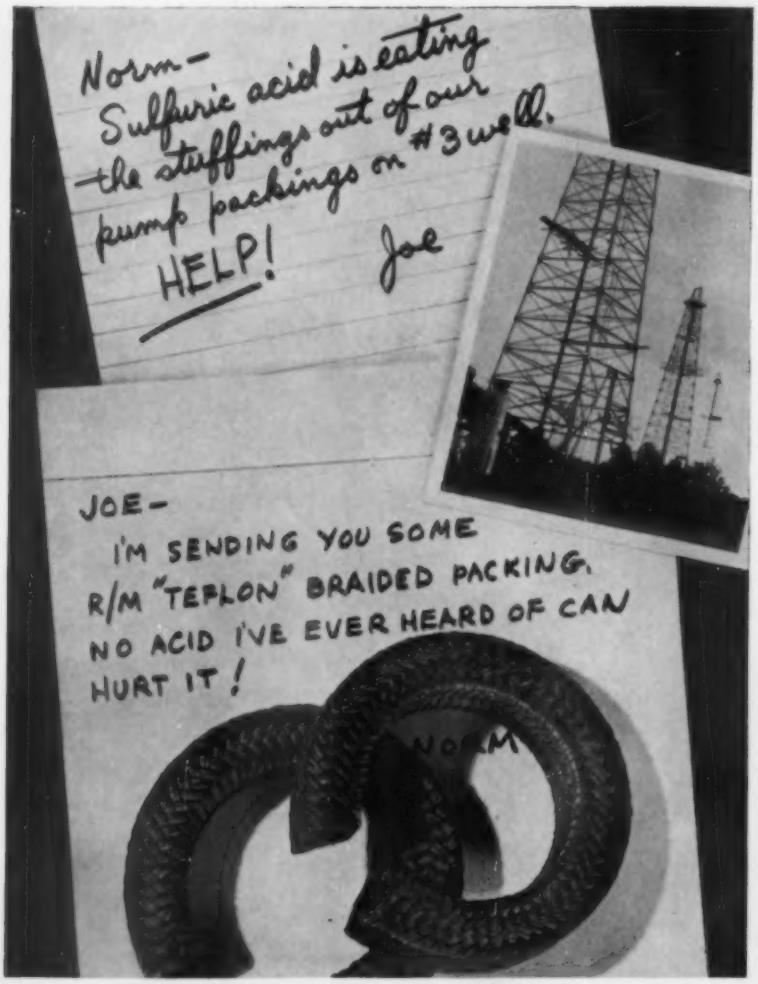
Norm—
Sulfuric acid is eating the stuffings out of our pump packings on #3 well.
HELP!
Joe
JOE—
I'M SENDING YOU SOME R/M "TEFLON" BRAIDED PACKING. NO ACID I'VE EVER HEARD OF CAN HURT IT!

The strong acids and corrosive fluids which normally cause packing troubles, both in the fields and in the refineries, can be forgotten when you use R/M "Teflon"* braided and asbestos packings. Except for fluorine gas and chlorine trifluoride, both at high temperatures, and molten alkali metals, "Teflon" shows no reaction against chemicals. No known industrial acids or caustics will attack it, and it has no known solvent. It has excellent nonadhesive properties and is ideal for parts and surfaces handling viscous or sticky surfaces.

These advantages, when built into engineered packings made by R/M, eliminate many of your major problems. "Teflon" braided packings, available with or without asbestos yarn—of the highest grade — are recommended for use on valves and pumps, as groove packings, and for gasketing.

R/M's engineers have amassed a wealth of experience in manufacturing packings and gasket materials to meet the most exacting requirements of the petroleum industry. This experience is at your disposal—call on R/M!

R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex,* Vee-Square,* Universal Plastic, and "versi-pak"*; GASKET MATERIALS; "TEFLON" PRODUCTS. SEE YOUR R/M DISTRIBUTOR.
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SHOWCASE . . .

New Literature

Temperature . . .

survey instrument, called the Delta-Log, is described in a new Worth Well price schedule. It makes a surface recording of the difference in temperatures between two thermally sensitive elements spaced several feet apart on a 1¼-in. o.d. carrier. The elements are unbalanced by a temperature disturbance and produce recorder deflection. A difference of 0.02° F. between the elements produces 1 in. of deflection. **Write or call: Worth Well Surveys, 3611 McCart, Fort Worth, for Delta-Log price schedule.**

Wood-tank handbook . . .

discusses the use of wood tanks, their capacities, physical and chemical properties of wood, and relation to expected service. The manual projects the use of wood to cover the most severe conditions found in chemical processing by the use of selected polymer linings. The 28-page manual also discusses design, installation, and care of wood tanks. **Write or call: National Wood Tank Institute, 332 South Michigan Avenue, Chicago, for Wood Tanks reference and data handbook.**

Sulfur-recovery unit . . .

designed to profitably convert H_2S (acid gas) to molten sulfur is described in a new four-page bulletin. It is a complete unit, shop-assembled, and can be shipped for installation on a concrete pad. The unit is ready to go on stream after connecting electric power and acid gas. Data required for a quotation is in the bulletin. **Write or call: Tears Engineers, 4617 Cole Avenue, Dallas, for sulfur recovery unit bulletin.**

Thermometers . . .

of the filled-system type are described in new 56-page Catalog C-60-2. They are designed for use with indicators, recorders, transmitters, and other electric or pneumatic control instruments. Vapor, gas, and mercury-actuated thermometers and thermal systems for use between −125° and 100° F. are described. **Write or call: Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Avenue, Philadelphia 33, for Catalog C-60-2.**

Safety shower . . .

and eye-wash fountain that are independently activated when you stand on aluminum platform treadles are de-

CHRISTENSEN'S **SALVAGE** PROCESS

Reduces Coring Costs

. . . by crediting all usable diamonds to the buyer after many hours of core bit use . . .

by matching core bits and barrels to the formation for maximum core recovery and minimum bit damage under any conditions . . .

by thorough, painstaking salvage process after bit use that guarantees greatest possible diamond recovery for lowest net bit cost.

With cores so essential for exploration, field development and reservoir data, call the Christensen engineer to obtain vital cores at "less cost per foot."

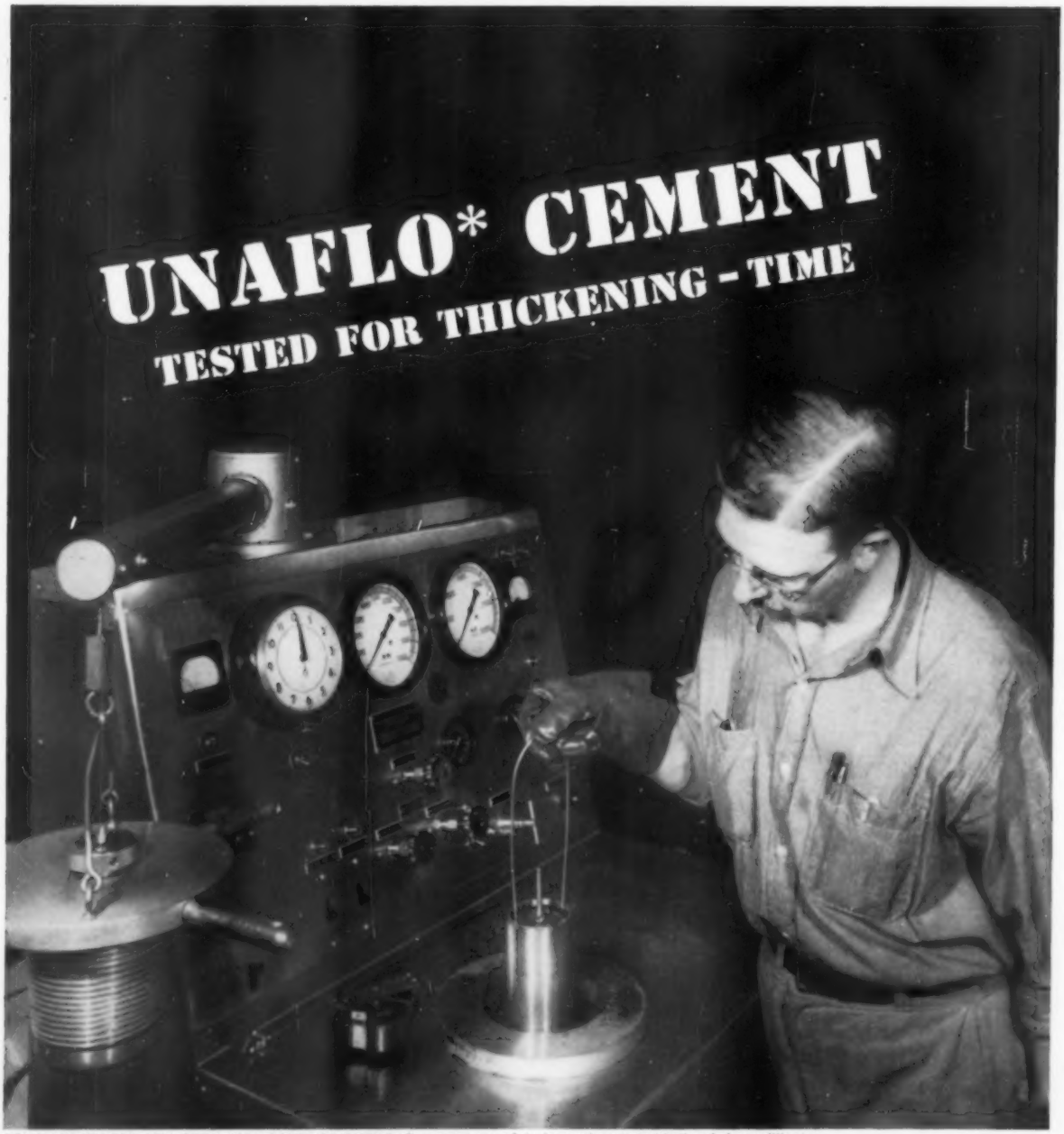
Illustration shows used bit ready for immersion in electric acid bath which releases the diamonds from the matrix metal.

Do you have our catalog? Write today for SD-608.

CHRISTENSEN DIAMOND PRODUCTS

LESS COST PER FOOT CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH 2nd WEST SALT LAKE CITY, UTAH



REMOVING SLURRY CELL FROM HIGH-PRESSURE TESTER after completion of thickening-time test at bottom-hole conditions.

- Careful attention to quality during the manufacture of UNAFLO retarded oil-well cement pays off in down-the-well dependability.
- Slurries made with UNAFLO cement pump easily, and *stay pumpable* under high bottom-hole temperatures and pressures, giving vital extra time in case of emergencies.
- After its retarded period, UNAFLO cement hardens normally to form a strong, well-bonded structure that is watertight and resistant to sulphate waters.

For typical data tables, write: Universal Atlas, 100 Park Avenue, New York 17, N. Y.

* "*UNAFLO*" *is the registered trademark of the retarded oil-well cement manufactured by Universal Atlas Cement Company.*

UNIVERSAL ATLAS CEMENTS

U-154

USS TRADEMARK

UNIVERSAL ATLAS CEMENT COMPANY—member of the industrial family that serves the nation—**UNITED STATES STEEL**

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new

paraffin scraper

4 ways better

Sunshine's new full length continuous spiral scraper

It's all new! Longer spiral (circles rod only once each 15") runs full length of sucker rod, with 8" clearance at each end for elevators. Clip-on wing reverses direction at center of rod. Read how you benefit:

1 saves time

Run it as fast as you like! Both ends are protected by rod shoulders to prevent hanging.

2 protects rods

Reversed spiral eliminates torque — prevents rods from unscrewing. Full-length design eliminates vibration, a major cause of rod breakage. Wing clips on securely—no welding on rods.

3 moves more paraffin

Longer spiral offers less foothold for clinging paraffin. Stronger flow carries cuttings away.

4 easier to install

Simple to install on location anywhere.

Write or call today for free literature and prices from one of oildom's oldest established manufacturers of paraffin-control equipment.

SUNSHINE IRON WORKS

601 W. Murphy Odessa, Texas
Phone FEderal 7-6651

scribed in a new four-page bulletin. A cabinet with doors houses all piping and two 1-in., quick-opening, self-closing valves in the Model CO-100 shower and eye wash. Instrument seal pots, housings, coolers, and strainers are also described in the bulletin. **Write or call: Moreland Associates, 63 South Avenue, Garwood, N. J., for Safety Shower and Eye-Wash Fountain bulletin.**

Protective coatings . . .

and linings of baked-on phenolic, epoxy, and other protective materials for all kinds of equipment are described in a new eight-page bulletin. The coatings are recommended for internal and external coating of pipe and other equipment to solve or prevent severe corrosion problems. The bulletin describes the plant facilities and the line of coatings and linings available. **Write or call: Lithcote Corp., 5000 West Lake Street, Melrose Park, Ill., for protective coatings and linings bulletin.**

Net-price catalog . . .

on fasteners designed to eliminate the complexities of list and discount pricings is available. It contains the net price for the complete listing of all sizes of every standard Harper bolt, nut, screw, rivet, and washer plus extra stock items. The 84-page catalog will be published in its entirety at least four times a year because of the frequent price changes of the metals used in the products. These include brass, copper, naval bronze, silicon bronze, aluminum, nickel, monel, and stainless steel. **Write or call: H. M. Harper Co., 8299 Lehigh Avenue, Morton Grove, Ill., for net price catalog.**

Centrifugal pumps . . .

for continuous operation within the medium pressure range are described in new Bulletin Form 7148-A. Cross-section views and table of dimensions illustrate the bulletin. The pumps are for general hydraulic service. They are a horizontally-split, single-suction type with 3, 4, 6, or 8 stages for capacities from 200 to 2,800 g.p.m. Pressures go up to 1,200 psi. and heads range between 460 and 2,400 ft. Any conventional driver can be used. **Write or call: Ingersoll-Rand, 11 Broadway, New York 4, for Bulletin 7148-A.**

Breakdown acid . . .

that is essentially an inhibited hydrochloric acid solution with highly efficient surfactants is described in a new technical-data report. The acid is used primarily for breaking down

Strahman

HIGH PRESSURE GAUGES

USED IN **REFINERIES** *AND* **CHEMICAL PLANTS** *THROUGHOUT THE WORLD*

THRU VISION

REFLEX
Single or Multiple Sections

TUBULAR

Gauge Cocks
•
Large Chamber Reflex Gauges
•
Heated or Cooled Gauges

SEND FOR **COMPLETE CATALOGUE**

STRAHMAN VALVES, Inc.
16 Hudson St., New York 13, U.S.A.

formations ahead of fracturing, cementing, and conventional acidizing. Surface-tension measurements and emulsion-tendency tests are discussed. **Write or call: Dowell Incorporated, P.O. Box 536, Tulsa 1, for Breakdown Acid technical data report.**

Metering pumps . . .

with diaphragm liquid end are detailed in new Bulletin 1157. The two-page bulletin specifies capacities, pressures, and materials of construction of the pump for metering corrosive, obnoxious or toxic chemicals. It also describes the features of the pump, including the mechanical actuation for correcting the volume of hydraulic fluid between each stroke. **Write or call: Milton Roy Co., 1300 East Mermaid Lane, Philadelphia 18, for Bulletin 1157.**

Axial compressor design . . .

and construction features are described in new Bulletin 16B8863. The compressors come in sizes from 8 M.c.f. to 1 M.M.c.f. per minute. Among advantages cited for the axial compressor are a basically constant volume with variable pressure output; high efficiency, compact, streamlined design; flexibility, and virtually trouble-free operation. **Write or call: Allis-Chalmers Mfg. Co., Milwaukee 1, for Bulletin 16B8863.**

Meehanite pump castings . . .

is the title of new 20-page Bulletin 36. Photographs show pump castings and the various pump types that use Meehanite castings. Also included are tables that illustrate property evaluations made from tests covering wear, resistance to acid, corrosion, impact, and erosion. **Write or call: Meehanite Metal Corp., New Rochelle, N. Y., for Bulletin 36.**

Open-side vise . . .

that will handle tubing, drill pipe, manifold fittings, or valves within a 2⅜ to 8⅝-in. diameter range is described in a new bulletin. The frame and base of the vise are a one-piece, solid, malleable-iron casting. The lower jaw of the vise is slotted to accommodate four tong dies. **Write or call: Baker Oil Tools, Inc., Box 2274 Terminal Annex, Los Angeles 54, for Pipe Vise bulletin.**

Abrasive cutoff wheels . . .

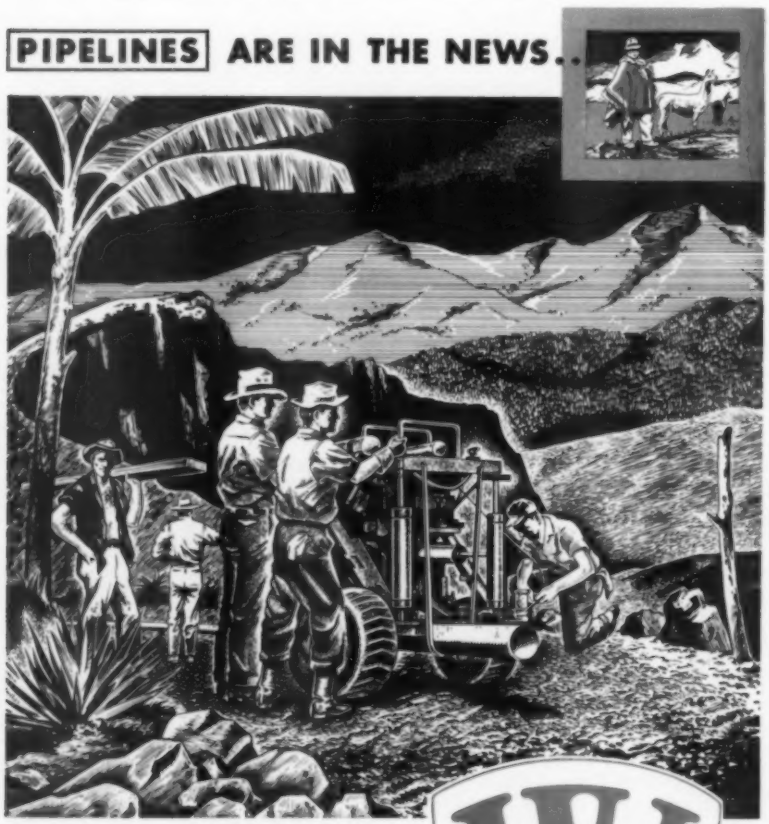
are discussed in a new 30-page booklet, "Which Abrasive Cutoff Wheel Is the Right Wheel?" The newest booklet in a series on abrasive cutoff characteristics, it deals with wheel selection. Twenty-nine illustrations show the various kinds of cuts. The comprehensive booklet is written in question and answer style. **Write or call: Wallace Supplies Mfg. Co., 1300 Diversey Parkway, Chicago 14, for Abrasive Cutoff Wheel booklet.**

Selector charts . . .

for lightweight steel and aluminum pipe and Victaulic couplings show the pressure ratings for the various sizes of pipe or tubing. Wall thicknesses and outside diameters are given for each size of aluminum and steel pipe. Comparison charts and installation-time studies are shown too. **Write or call: Victaulic Co. of America, P.O. Box 509, Elizabeth, N.J. for Steel Pipe Bulletin 57S and Aluminum Pipe Bulletin 57A.**

Safety equipment . . .

catalog is a comprehensive booklet showing research, production, and other lines of safety equipment. Safety spectacles of Optilite—a formula of compounded resins—and hardened glass are featured in a variety of styles and designs. Goggles, hats, and aprons are also among the items described. **Write or call: United States Safety Service Co., 1535 Walnut Street, Kansas City 8, Mo., for safety-equipment bulletin.**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IN STANDARDIZING ON GASO PUMPS

Let's face it. It isn't pumps but *pumping service* that we buy when we place a pump order; and it's service that sold us on Gaso Pumps. Service that starts with intelligent recommendations by nearby distributors. Service that continues through years of dependable performance. And service that extends, in many cases, a quarter-century beyond the purchase date, with the immediate delivery of parts for long-obsolete standard models. Because of such service, Gaso became a habit with us...a habit we made official by specifying Gaso Pumps whenever the requirements fall within their capacity range.

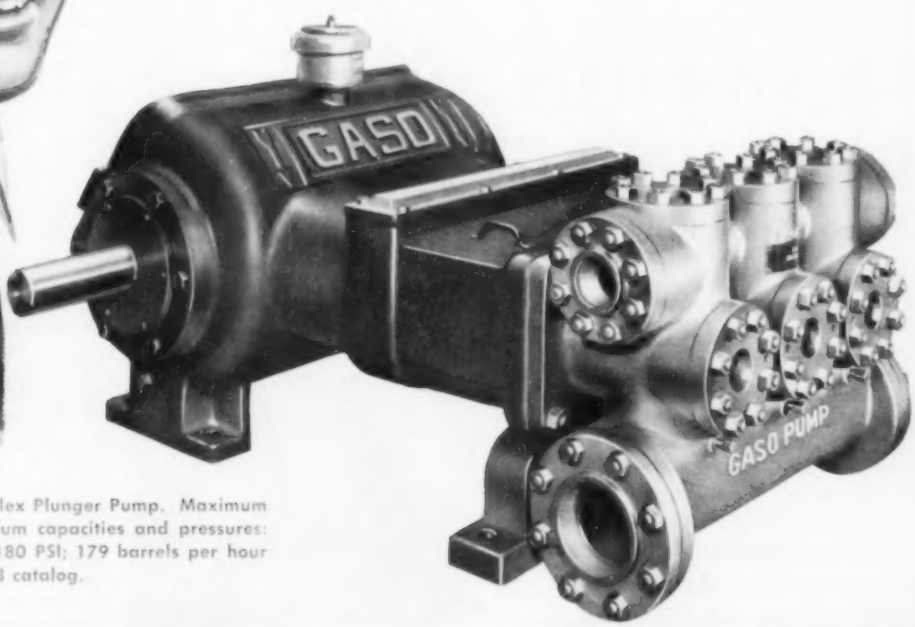

Fig. 3466 Horizontal Triplex Plunger Pump. Maximum speed, 250 RPM. Maximum capacities and pressures: 91 barrels per hour at 1180 PSI; 179 barrels per hour at 600 PSI. Write for 1958 catalog.

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Barton Instrument Corp. Appoints Three Executives

Claude B. Nolte has been appointed vice president in charge of product engineering and development at Monterey Park, Calif. William S. Christian has been appointed sales

C. B. NOLTE W. S. CHRISTIAN

manager, and Everette M. Furr as factory superintendent at that location.

Nolte joined Barton in 1946 and has served in the capacity of vice president, sales manager, and vice president in charge of production. Christian came to Barton in 1949 and has been assistant sales manager since 1956. Furr has been production planning supervisor for 6 years. He joined the company in 1947.

Cabot Shops, Inc., Makes D. C. Kelley Sales Agent . .

in Anaco, Ven., according to Fred Tinsley, export manager for Cabot.

Kelley, an engineer servicing Franks equipment for 12 years, will assist all South American representatives of Cabot and Franks Division on the sales and servicing of Cabot units and Franks well servicing units and drilling rigs.

Schlumberger Announces Seven New Assignments . .

in its field organization. New sales engineers for Schlumberger Well Surveying Corp. at Laurel, is F. E. Kendrick. Moving to Farmington, N. M., as division engineer is P. H. Hines, who formerly was location manager at Donaldsonville, La.

Van Maraman has been transferred from Tyler, Tex., to Wichita Falls, Tex., as sales engineer. F. Perkins, formerly senior sales engineer at Wichita Falls, is now in Lubbock, Tex., as location manager.

E. A. Colle, formerly with the New Orleans office, has been promoted to assistant manager of the Mid-Continent area at Tulsa. H. E. Hamilton, former district manager at Lubbock, has been promoted to senior sales engineer, Permian basin division at Midland. V. J. Davis has been named sales engineer at Wichita Falls.

Four Changes In Gulf Coast Announced By Oilwell . .

involve Paul B. Norton, A. L. Crenshaw, Harmon Holcomb, Jr., and Gene E. Hatton, according to M. F. Jones, Gulf Coast area manager of the division.

Norton was made district representative at Houma, La., and Crenshaw, field representative at Harvey, La., was transferred to Morgan City, La. Holcomb, field representative at Beaumont, Tex., shifted to Brookhaven, Miss., and Hatton, field representative at Beaumont, moved to New Iberia, La.

Norton was employed by Oilwell in 1954 at Brookhaven and was appointed field representative at that location in 1956. Crenshaw was employed at Harvey in 1956 and was appointed field representative in 1957. Holcomb joined Oilwell in 1952 at Snyder, Tex. He was transferred to Denver City, Tex., in 1953, and was appointed field representative at that location in 1955. He was transferred to Beaumont in 1957. Hatton was employed in 1955 at Beaumont and was named field representative there in 1956.

A 6-Ft. Backfill Blade Drags Spoil From Bank . .

of backfill onto the grid of the Crutcher-Rolfs-Cummings ditch padder. Rocks larger than 1-in. diameter are conveyed across the grid and then dumped on the near side of the ditch for later backfilling. The revolving steel grid sifts dirt out of the backfill and deposits it on the pipe in the ditch. The ditch padder unit is mounted on a standard ¾-yard drag line. The unit successfully padded a mile per day in rocky areas.

B-I-F Industries Appoints Gooch Service Engineer . .

for the Dallas office. He will assist in the installation and servicing of the company's meters, feeders, and controls for industrial and municipal users in that area.

C. S. Gooch ran his own engineering company in Amarillo for 10 years. His engineering experience includes service with Braniff Airways, Defense Supplies Corp., and Otis Elevator Co. Before his present position he was division manager of Lewis Dodson Engineering Co., of Dallas, a B-I-F distributor.

Hercules Motors Corp. Appoints A. D. Marks . .

as director of sales. The announcement was made by William L. Pringle, president.

A. D. MARKS

Marks was identified with submarine commands during his Navy career and was assistant head of the internal combustion engine section of the Bureau of Ships of the Navy.

Magcobar's Mountain Distributors Merge . .

according to Ernest Howell, president of Northern Mud Co., Inc., Billings, Mont., and Ray Dillman, president of Mountain Mud Co., Inc., Casper, Wyo.

The merged company will operate under the name of Northern Mud Co., Inc., with general offices in Billings. A sales and service office will be maintained in Casper.

The company will distribute and service Magcobar products in Washington, Idaho, Montana, North and South Dakota, Wyoming, western Colorado, Utah, Nevada, and Oregon.

Howell will remain as president, with Dillman, vice president; and Gregg Kildow II, as sales manager. Operations will be headed up for the northern division by Wally Fraser, Williston, N. D., and Bill Dahlem of Billings, Mont., will be district manager. Homer B. Brown, Jr., of Casper will head up the mountain district. John Koons of Casper and Don Akers of Grand Junction, Colo., will be district managers for Brown.

J. F. Mason, Jr., Promoted To Petroleum Development . .

by The International Nickel Co., Inc., according to F. L. LaQue, vice president and manager of the division. He will handle development activities in the petroleum industry for the development and research division.

Mason joined the development and research division in 1937 and has been engaged in activities of the corrosion engineering section.

Myoco, Ltd. To Make, Sell Equipment In Toronto . .

operating as a subsidiary of Morris-Young-Owens Co., Houston. Myoco will handle the same line of pipeline equipment in Canada that Morris-Young-Owens does in the United States.

I. L. Jones is superintendent and in charge of the operation, and J. Wilson Elden is office manager.

Journal Representative Hosts British Adem . .

at a luncheon held recently at the Ritz Hotel in London. Harry Becker, who represents The Oil and Gas Journal, Petroleo Interamericano, and Oil and Gas Equipment in European countries invited advertising people in England to a meeting to discuss markets in the petroleum industry and to view a new film, "What's In It For You."

The film, recently released by The Oil and Gas Journal deals with the aims of an industrial publishing firm, and ties these aims in with the interests of both the reader and the advertiser.

Attending the luncheon meeting were: George Bentley, Thos W. Ward Ltd.; J. R. Brinkley, Pye Communications Ltd.; D. J. Butchart, British Petroleum Co., Ltd.; H. B. Capes. Decca Navigator Co., Ltd.; C. F. Cox, Mayfair Advertising Ltd.; L. H. Daiken, Le Grand Sutcliffe & Gell Ltd.; A. W. Davies, K&S Advertising Ltd.; L. S. Davis, W. J. Fraser & Co., Ltd.; W. A. M. Dickson, Moon Brothers Ltd.; F. J. Donovan, John Tait and Partners Ltd.; B. Evans, LaFarge Aluminious Cement Co., Ltd.; Ivor B. N. Evans, Press Relations for Industry; G. Fitzgerald, Ruston & Hornsby Ltd.; Sir Alexander Galloway, Richard Costain Ltd.; J. M. Hallett, Ferranti Ltd.

J. F. Harper, Woodfield Hoist Co.; R. S. Harris, Vokes Ltd.; H. Barty King, Cape Asbestos Co., Ltd.; W. T. Lamb, Newalls Insulation Co., Ltd.; W. H. Marden, Spottiswoode Advt. Ltd.; F. Rowlingson, Rowlingson-Broughton Advertising; R. C. Simpson, Newman Hender Co., Ltd.; T. F. Simpson, Scammell Lorries Ltd.; James H. Sutherland, James Sutherland Publicity Ltd.; K. Tardif, G. S. Harvey (London) Ltd.; P. J. Vinson, Rolls-Royce Ltd. Diesel Engines; M. A. H. Walford, Plenty and Son Ltd.; R. F. G. Wane, International Paints Exports Ltd.; P. L. Woodall, Davey Paxman & Co., Ltd.; B. R. Hill, Muirhead & Co., Ltd.; G. Skinner, Roper Stammers Ltd.; C. Barwell, Mullard Ltd.; Walter R. Shinner, C. G. Hollowell, D. Napier & Sons Ltd.

Continental-Emsco Co. Starts Plant Expansion . .

at its Houston manufacturing facility. The program will consist of a new engineering office building, an engineering laboratory building, an addition to the personnel building, a warehouse, and a shop building.

The new engineering office, of about 20,000 sq. ft. floor area, will be located adjacent to and connected with the existing office building. The engineering laboratory, of 1,800 sq. ft. floor area, will be used for metal-

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Available to meet all oilfield pumping demands are units from 3,000 lbs. to 33,000 lbs. polished rod load and 24" to 132" stroke. Units are floor clearing with rack-and-pinion balance weight adjustment, API Standard gear reducers, LEGRAND double-taper wristpins, self-aligning equalizer and wristpin bearings, lateral and fore-and-aft beam adjustment, swing-back mulehead, LEGRAND carrier bar, ground level lubrication, all bolts with Unified threads. LEGRAND equipment embodies long practical experience in the Oil Fields of the World.

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lurgical and basic engineering laboratory work.

The addition of approximately 3,900 sq. ft. to the personnel building will be used for housing personnel, plant safety offices, and expanded shop employes' wash room and locker facilities. A structural steel warehouse of approximately 5,600 sq. ft. will store foundry pattern and equipment.

A structural steel shop building of approximately 100,000 sq. ft. will house the structural fabrication and welding operations.

An addition of approximately 29,000 sq. ft. to the main shop building will be an expansion of product machinery assembly operations.

Completion of the plant expansion program will virtually double the size of the Houston manufacturing plant. Scheduled completion date is December 31, 1958. The oil-field manufacturing division of the Los Angeles plant will be transferred to the new Houston facility. There has been an addition of land from 45 acres to approximately 80 acres. Prior to building program there were 4½ acres under roof. Upon completion there will be more than 80 acres under roof.

Continental-Emsco is a division of Youngstown Sheet & Tube Co.

Bethlehem Supply Co. Opens Store at Woodward, Okla. . .

to maintain a stock of drilling and production equipment and general supplies applicable to the activity of the area.

The new store will be under the supervision of W. T. Davis, district manager from Oklahoma City. R. E. Skelton, formerly at Ponca City, will be in charge of the branch.

D. G. Collins, machinery sales representative at Farmington, N. M., has been promoted to store manager and field representative at Farmington.

"Jug" Davis To Serve Brown Oil Tool Co. . .

as sales engineer and has established a Brown service and administrative office in Dallas serving the Dallas-Fort Worth area.

The facility will provide better service for operators in that area. Brown manufactures packers, liner equipment, and fishing tools.

Before joining Brown, Davis was associated with a major oil company for 10 years as an engineer and in the production department.

Pan Air Corp. Made Trecker Gulf Area Distributor . .

at New Orleans airport, New Orleans, La., according to Carl Wootten, executive vice president of Trecker Aircraft Corp. A. Brown Moore, second from right, president of Pan Air, is pictured above with Pan Air's executive team (l. to r.) Hank Wallach, vice president, flight services; Bob Smith, vice president, purchasing; Moore, Al Buebeck, vice president-general manager.

Chrysler Corp. Appoints Reynolds and Soffer . .

as industrial engine dealers. E. A. Reynolds operates Sirco, Inc., in Key West, Fla. In St. Louis, Mo., Harry Soffer operates Standard Auto Parts Co.

Mission Manufacturing Co. Elects C. O. Bartley . .

vice president in charge of engineering and manufacturing and a director.

Bartley joined Mission in 1942. His first assignment was as junior engineer. Bartley became schedule department supervisor in 1948 and in 1949 was named production superintendent. Until his recent election, he was works manager, a post he has held since 1954.

AC Spark Plug Announces Four Sales Changes . .

according to E. H. Francois, general sales manager, replacement sales.

J. Patrick Kane, Detroit regional manager is now director of specialized marketing and handles such accounts as petroleum companies.

George R. Work, formerly general merchandising manager, is Detroit regional manager. Willis J. Oldfield, assistant general merchandising manager, is director of advertising and promotion.

A. S. Holmes, director of national accounts, goes on special assignment on Francois' staff.

Robert P. Ramsey Forms Consulting Firm . .

R. P. RAMSEY

to develop analytical corporate studies to assist management's planning for future growth of earnings. Ramsey was formerly director of market research of Cooper-Bessemer Corp. Robert P. Ramsey & Co., Mount Vernon, Ohio, is founded upon 25 years of successful experience as a part of top management dealing with new products and markets, from the engineering concept to sales, for four national corporations.

The need for such service is particularly acute at this time. Companies are now keenly aware of the path of the general economy and are evaluating the different courses toward sales and earnings of 1960-65.

National Supply Co. Moved To New Office . .

in the First National Bank Building, Denver, on March 1. Robert D. Stottlemyer is division manager. The division directs the company's oil-field-supply activities in Colorado, Idaho, Montana, North Dakota, South Dakota, Utah, Wyoming, and parts of Nebraska and New Mexico.

Welex, Inc., Appoints J. B. Fleming To New Post

He will serve as vice president and division manager of the newly organized Louisiana Gulf Coast divi-

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sion. Division offices are in New Orleans.

The division includes districts in Harvey, La., with K. W. Carlson as manager; Houma, La., and Laurel, Miss., with J. R. Packard as manager with his office in Houma; Lafayette, La., and Lake Charles, La., with H. F. Beleau as manager with his office in Lafayette.

Other Gulf Coast personnel include W. L. Laflin, assistant division manager; H. A. Bergman, division sales manager; and D. W. McLendon and J. T. Thompson, division sales engineers.

C. B. Whyte Elected Head Of National Constructors . .

C. B. WHYTE

and W. R. Wood, president of The Girdler Corp., Louisville, Ky., was elected vice president.

The association is an organization of engineering and construction firms. Whyte joined Procon, Inc., in 1950 and has been president since 1952. He was general superintendent in charge of construction of Maumelle Ordnance Works, Little Rock, Ark., and resident engineer directing erection of Cities Service Refining Corp.'s Tutwiler refinery at Lake Charles, La.

H. V. Beck Talks on Meters At Farmington ISA Meeting

Beck discussed the use of the quadrant edged orifice meter for measuring viscous fluids in an address to the Four Corners chapter of the Instrument Society of America at Farmington, N. M., on January 16.

He pointed out that American Meter had originated quadrant edged orifice plates and discussed the various factors effecting orifice meter accuracy.

Petrol-Structors, Ltd. Appoints R. F. Parker . .

as executive vice president, general manager, and director at Calgary, Alta. Petrol-Structors have been engaged in project management, design, inspection, and construction supervision in western Canada and Alaska.

Parker was associated with O. L. Olsen Co. in Houston and was with Bechtel Corp. in San Francisco.

Under Parker's management Petrol-Structors will continue work in the pipeline industry and will expand operations into gas and oil processing, petro-chemical, and industrial plants.

Ken Kettlewell Advanced to Vice President-Director . .

of Petro-Automation Industries, Ltd., Edmonton, Alta. He will be concerned with development of lease-automation systems, including LACT systems and related pipeline metering and control. Before joining Petro-Automation, Kettlewell was with Texaco Exploration in Edmonton. He was concerned with the design of their LACT systems.

Sales and service are offered on Rolo meters and well testing equipment, Granco pipeline meters and accessories, Skinner controls, Norwood measurement and control systems, and Prescoswitch pressure switches.

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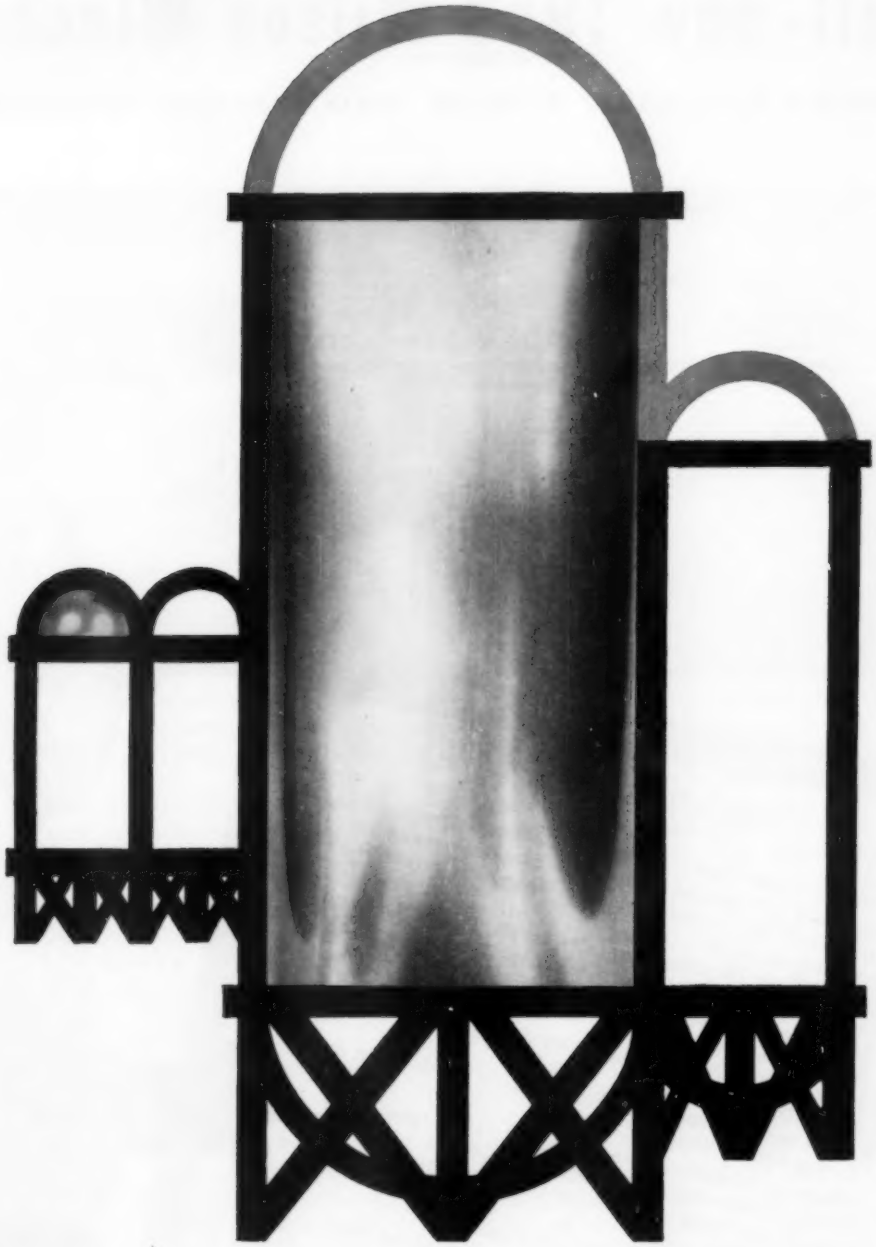

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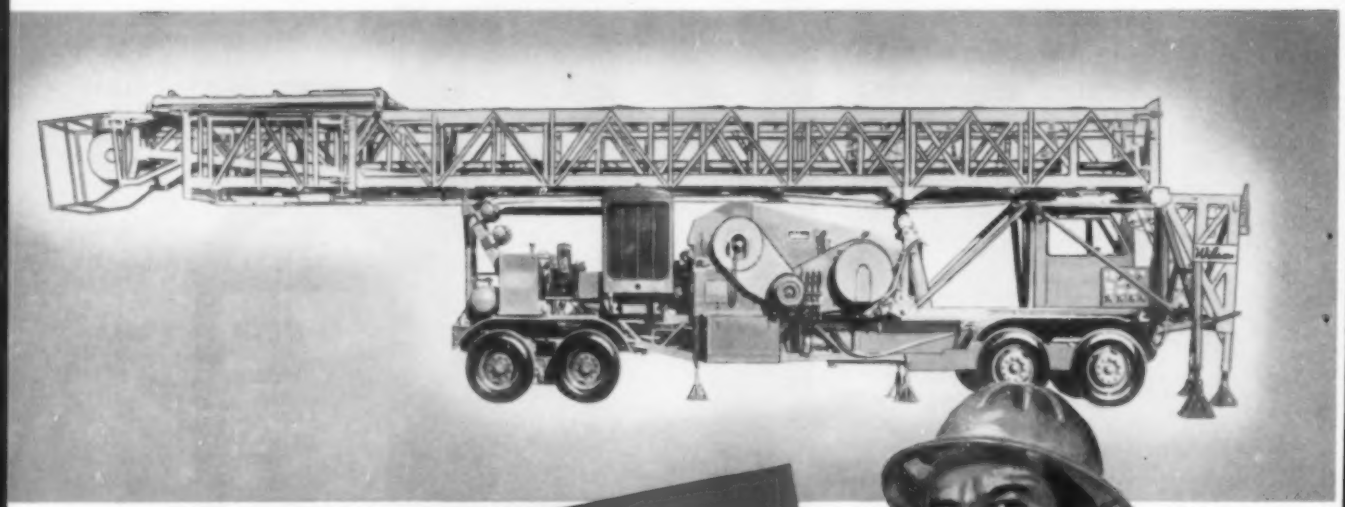

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A professor laments . . .

. . . and an editor replies

Dear Mr. Chief Geologist:

As a teacher of geology, I am frequently told by friends in industry that "The geology you **teach** is 10 years behind the geology we **use.**"

As a former exploration geologist, I also have made that comment. And since moving over into the receiving end, I have had opportunity to examine the truth of it. I am forced to admit that it is true, especially for those areas of major interest to the oil industry.

Because of this, a graduate from our universities goes back to "school" when he is employed. Not only must he learn techniques—which industry is far better prepared to teach than are schools—but he needs to learn that newer basic geology which has not yet found its way into the classroom. Before he can progress he must assimilate all those accumulated discoveries of 10 years of directed effort while at the same time trying to learn the specialized techniques of a complex science.

This is regrettable, for had he been taught **today's** geology while yet in school, his training time in your organization could be cut in half. His first day of truly productive effort could be advanced by months—and more important, his mind would be prepared for those yet newer discoveries with which he will be bombarded day by day during his professional life.

This problem is of complex origin. It stems partly from the isolation of many teachers from any contact with the industrial groups most interested in the teachers' product. The textbooks are written by teachers, and this compounds the error. The research and discoveries to which teachers (the writers of textbooks) have ready access are but a minute part of the total. Only that research of academic origin, or reported in journals, or discussed at professional society meetings is generally available for their consideration.

Published data upon which theories rest are often years old by the time of publication—ancient by the time a textbook is published. The new information is seldom available to the textbook writer, for little

Dear Professor Hayward:

If it's true that the geology you teach is 10 years behind the geology we use today, it's also true that the geology we're using is another 10 years behind the geology we **need.**

How can you hope to teach all the things that are expected of today's geologist? Our profession has become so specialized and has so many facets that the best you can hope for in 4, or even 6 years, is to give the student a solid foundation of basic fundamentals. I believe you'll find that this is about all the industry now expects of you. And many companies prefer it this way, for they want to mold the graduate and teach him in their own way after he leaves the classroom.

You are probably correct when you say that the newer basic geology has not yet found its way into the classroom. Important things are going on in the research labs of oil and engineering companies, and while much of this may truly bear the "confidential" label, a great deal of it does trickle through to the public by various routes.

It has been said that many oil fields lie hidden in the files of oil companies. It has also been said that oil is found in the minds of men. And your job is the molding of these minds. I believe that one of the gravest symptoms facing the nation today is the lack of opportunity, or even inclination, to think. The exploration managers of most oil companies are so burdened with committees, conferences, and paper work that they seldom have a real chance to concentrate on where oil might be found. And in many cases, this carries right on down to the district geologist. Perhaps this is why many of our largest oil pools have been found by daring independent wildcatters.

This applies not only to industry. I feel sure that it carries over into the classroom. There are so many things to be done that neither you nor the student has time to develop the art of thinking. Such things as "map-staring," case-history study, and reading the works of our great discovery thinkers tend to be neglected in our formative student years,

IN THE ROCKIES, many soluble pays respond best to a combination acidizing and fracturing service. Acid Petrofrac* employs an acid-oil emulsion that not only carries sand well but provides a retarded acid action during treatment. Many wells respond to this double action with fast payouts and slow decline curves.

IN OKLAHOMA, Sandfrac*, using refined oil or lease crude as the fracturing fluid, is particularly suited for many formations of low solubility. Refined oil of medium gravity has many of the desired qualities of a fracturing fluid. On occasion, lease crude is modified with F.L.A.* (Fluid Loss Additive) to lower its fluid loss characteristics.

ALONG THE GULF COAST, the tighter formations are often fractured with Stratafrac*. The fluid used in this service is an acid-kerosene emulsion that has excellent sand-carrying characteristics. It has proved to be reliable and is designed to clean up fast. Addition agents are sometimes added to prevent silicate swelling and emulsions.

IN CANADA, Waterfrac is used to fracture various gas pays. The thickened water used in this service is designed to carry high concentrations of sand down tubing effectively. The materials used in Waterfrac may be prepared and hauled to the location, or mixed on the job. The resulting fluid is not volatile.

WHY DOWELL OFFERS THE WIDEST VARIETY OF FRACTURING SERVICES IN THE OIL INDUSTRY

Oil and gas bearing formations exhibit infinite variations in composition, fluid content and type of drive. It's no wonder then, that a single fracturing fluid or technique can not be used to produce best results in all wells. That is why Dowell offers nine basic fracturing services — with many variations of each.

Take, for example, the question of formation solubility in an acid-base fracturing fluid. In the case of a highly soluble limestone it may be necessary to slow down the acid action. In the case of a dolomite, an intensified action may be desirable. To meet this wide variety of solubility problems Dowell has developed many addition agents to alter the action of its acid-base fracturing fluids.

Also, consider the question of fluid injection rates. While high-injection-rate fracturing has proved highly successful, it is not always economically sound to pull tubing for a frac job. And injection rates are limited when it is necessary to pump down the tubing. To meet these different requirements, Dowell offers many fracturing fluids with varying sand-carrying abilities. In high-injection-rate jobs fresh water or unthickened lease crude are low in cost and have sufficient sand-carrying capacity — but for injection down tubing, emulsified or jelled fluids and FLA* (Fluid Loss Additive) are often recommended to prevent sand screen-outs.

Solubility and injection rate are only two of the many variables your Dowell engineer considers before helping you choose the best fracturing service for your well. When his study of your problem is complete, he can select from the widest variety of fracturing services in the industry. He can fit Dowell's specialized pumping equipment — including the famous Allison aircraft engine pumper or the smaller twin diesel pumper — to the job requirements. For the more unusual problems, he can call for assistance from Dowell's vast research and laboratory facilities in Tulsa.

Take advantage of this knowledge and ability on your next fracturing job. Call any of the 165 Dowell service points in the United States and Canada. In Venezuela, contact United Oilwell Service. Dowell Incorporated, Tulsa 1, Oklahoma.

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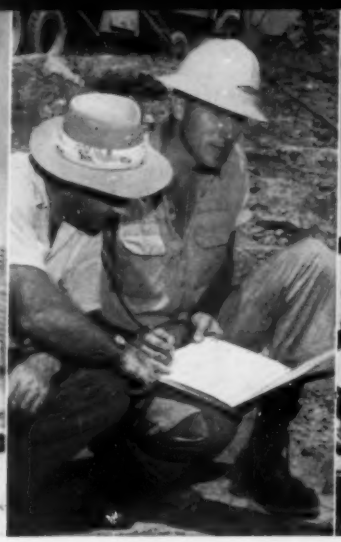
Services for the oil industry DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

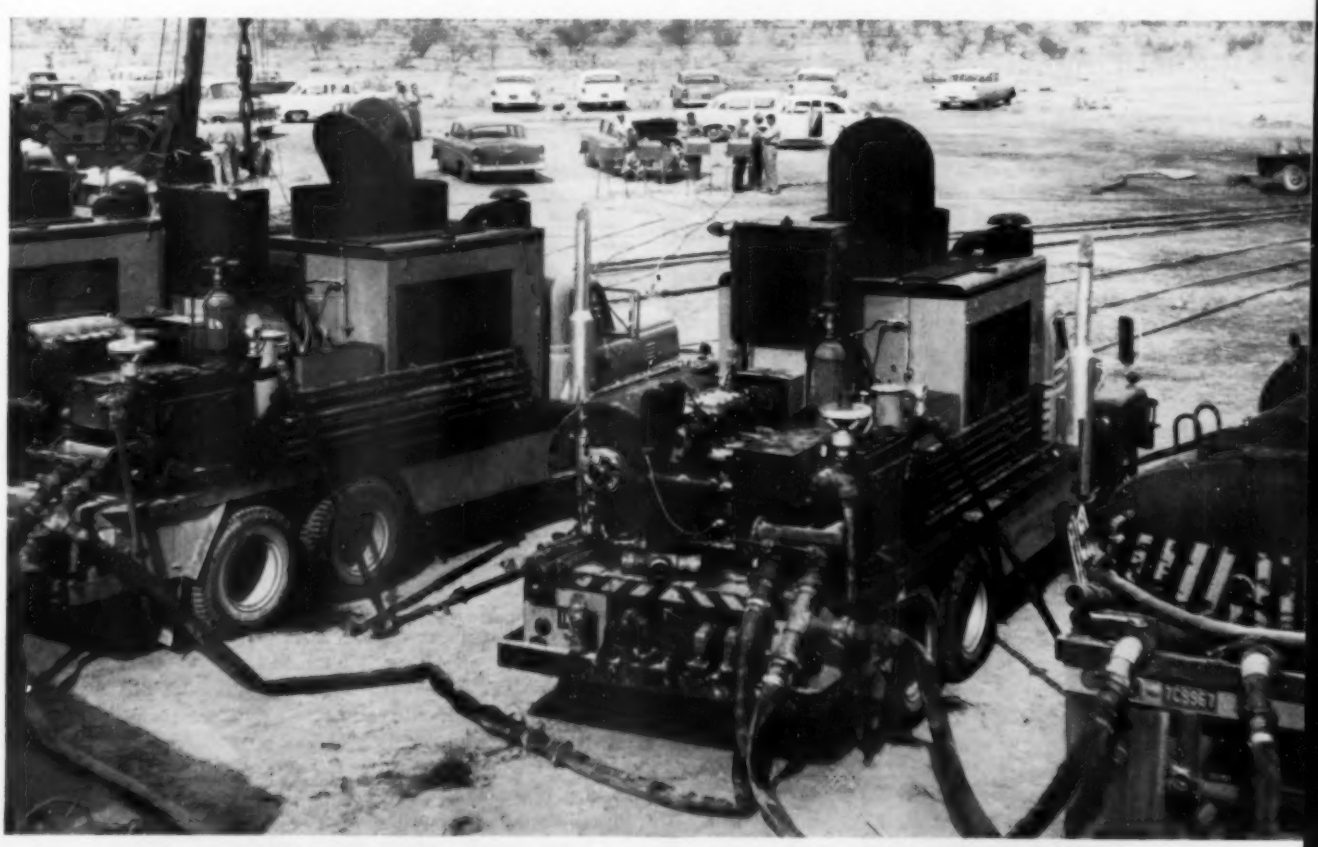
IN ILLINOIS, formations such as the Aux Vases sandstone have been successfully fractured with Petrojel*. The jelled crude used in this service combines good sand-carrying capacity with low friction loss. Troubles are few and, due to the low cost, many treatments pay out in less than a week.

IN EAST TEXAS, Petrofrac* is finding use on new wells completed in the Travis Peak formation. The emulsified oil used in this service combines excellent sand-carrying qualities with dependable performance. And the net cost is at a minimum, when it is considered that the operator can furnish the oil and sell it after the treatment.



IN NORTH TEXAS, Frac Acid is often used in such formations as the Caddo and Canyon limes. The fracturing medium is a thickened acid. The Caddo and Canyon formations are highly soluble, and Frac Acid is designed to give deep penetration. Many of Dowell's addition agents may be added to help achieve even better results.

NEAR FARMINGTON, N. M., the Pictured Cliffs and the Mesa Verde series of gas sands respond exceptionally well to Riverfrac*. Fresh water from the San Juan river makes a low-cost, non-volatile fracturing medium. Low fluid costs make large volume treatments practical. Treatments have produced some unusually large production increases.



IN THE PERMIAN BASIN, formations such as the Clear Fork and San Andres exhibit good acid solubility plus a surprisingly high salt content. Dowell has developed Duofrac* especially for these formations. The fracturing fluid used in this service consists of fresh water with a low-concentration of acid added. The fresh water acts to dissolve salt while the acid attacks the lime or dolomite. Dowell addition agents may be used to reduce fluid loss, and to prevent emulsions and silicate swelling. Results from Duofrac are frequently outstanding.

Professor: "Hide that 'confidential' stamp. Open up that dusty filing case to us."
Editor: "How long since you invited an industry man . . to your classroom?"

of the fundamental industry-sponsored research finds its way into publication.

The men in industry who are best prepared to aid—the men who do the research—work in an atmosphere which does not encourage them to advertise their discoveries, nor do they as a group, often make effective contact with those who teach. Free to criticize, they are not available for help.

Who then is most to blame for the teaching of sometimes archaic geology?

We, the teachers, are partly to blame—for we do not make the most of the opportunities available for contact with the research end of the industry.

In your own organization, however, there is the major culprit: a man who could with one act wipe out **half** of the gap between teaching and working geology. He has deprived us of information we must have if we are to train the men you want. He has deprived you of thousands of man-days of productive work—for you must make up for our weaknesses. He creates a gulf between us, and in this he has become more effective with the passing years.

Who is he—this enemy of yours and mine?

He is the man who stamps everything from lunch buckets to maps with a large red **"CONFIDENTIAL!!"** With amazing lack of discrimination everything from the company copy of The Oil and Gas Journal to the late wildcat location receives his mark.

The way to wipe out the problem is at once simple and effective: **Hide the stamp!**

Force a substitution of careful consideration for ham-handed action. Decide whether a piece of work is truly confidential. If it is not obviously so, then ask why it should be so marked.

We do not want your new locations—we have a couple in mind ourselves and we have no real desire to share them with you. But how "confidential" need be the beautifully comprehensive literature surveys with which many research projects start? These represent weeks of skilled effort—they collect data from a thousand sources not readily available to us. Their release does not deprive you of 1 hour's time, but it may save us the year of effort that went into their preparation. They could be starting points for whole fields of academic study, independent of your own research. And they could open the eyes of students to literature they would otherwise never see.

How confidential is the laboratory exploration in the behavior of elastic waves? How confidential is the study on the geochemistry of reef sedimentation? How confidential is the study of the diagenesis of clays? What does the confidential stamp add to the value of the stratigraphic study completed 10 years ago and still hidden in its filing case?

Each of these studies started with an idea. Where is the idea now? Where are all the many men who read that report 4 years ago? It's a safe bet that some and this is about the only time that we ever have the opportunity to do these things.

There are many ways, however, to strengthen the contacts between industry and the classroom. And we're sadly neglecting them. How many of your students attend the meetings of the local geological society, the regional meetings, and the national conventions? Sure, these things require travel, money, and time. But if you make the time available to the student (excuse him from his classes), I've a hunch that he'll dig up the money for the travel. There is a lot to be learned at our various meetings and symposia, and I feel that the schools aren't doing a good job of encouraging attendance by either faculty or students. Perhaps industry should contribute funds for those professors and students who want to attend these functions.

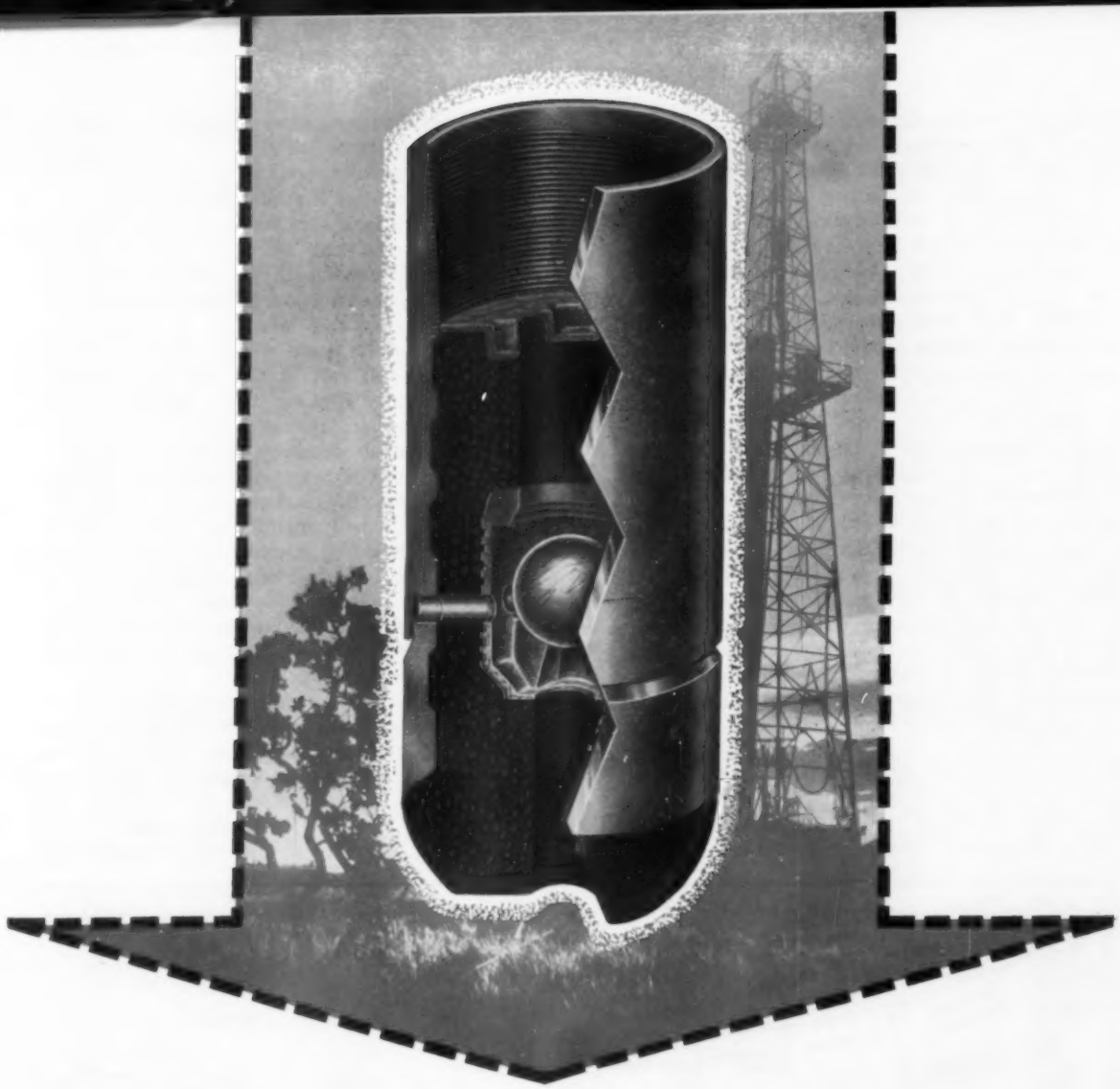
How long has it been since you invited an industry man to substitute for you in your classroom? Do you have regular seminar sessions conducted by industry men, or a panel of them? In a question-and-answer session, an inquisitive student could probably draw out a great deal of information that would never appear in print or be heard from a convention platform. Some schools are using these seminars to good advantage. They benefit both student and speaker.

Do you keep industry informed of your activities? Do you send lists of your masters' and doctors' theses to the exploration managers of the various companies? Do you publish a list of these in readily available form? Perhaps a simple letter mentioning the various subjects under study in your school would help—address it to Geotimes and see what happens. When you have a seminar, call it to the attention of the industry in some way. Some colleges have regular press releases on such things.

You say that the textbooks are written by teachers . . . "and this compounds the error." But there are some fields in which you can get away from teacher-authored textbooks. One of our finest current texts on petroleum geology was written by an outstanding industry man. Some geology departments are using The Oil and Gas Journal as a laboratory manual and as a means of keeping up to date on current activity.

How many professors do you see on convention programs? Not many. Is this because they are too shy to offer a paper, don't have time to prepare one, or because they have an "ivory tower" complex precluding any contact with industry? I think professors could greatly improve their service to regional and national meets in this respect. The convention platform can be a fine sounding board for our educational institutions' needs and wants.

Your remarks about the "confidential" stamp remind me of a recent incident in our national Government; if you recall, the research on improvement of the bow and arrow was classified as



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of them are working for someone else. The turnover in exploration personnel has distributed these ideas and conclusions to a wide segment of the industry. The "Confidential" stamp has kept the idea secret largely within your own organization because here it must remain locked in your files; and it has kept the development from us because we seldom see the man who left your organization.

While these works repose in your files, your next employe reposes in my class. If he is to be the future of your company he needs your help now.

For this reason, I have a request.

Open that filing case—look through those studies that might be of interest to the academic field. If they are more than 3 years old, does that "Confidential" stamp have any **real** significance? Have these works not served their intended purpose in **your** office? Now let us have them. You may find that your secondary-recovery program may be far more profitable than the initial program.

Publish these papers in the recognized journals, in special company publications, through microfilming agencies. Let us know of their existence and availability. Help us give you better geologists.

After all, it's your future, too!

Sincerely,
O. T. HAYWARD
Professor of Geology
Baylor University
Waco, Tex.

"secret." At first this seemed comic, but later it turned out that there really was serious intent to adapt this primitive weapon to modern use in war. Perhaps the oil companies feel the same way.

Although I agree that the confidential stamp is overused, I have seen many instances in which practical application finally was made of work that seemingly had lost its value. Nothing is so valuable, actually, as an old map. Many oil fields today are being found on the basis of maps 20 years old or more. This is all part of the thing I mentioned earlier—discovery thinking. The stratigraphic study completed 10 years ago, still hidden in its filing case, may lead to discovery of an oil pool later.

So there are points on both sides. You need the basic data, and so does industry. I don't believe that industry intentionally hoards this information to keep you from having it, and I believe that if you make your plea often and loud, much of it might be released to you. On the other hand, in this dog-eat-dog business of competition, many companies will be reluctant to let go of any information that might lead to a new oil or gas field.

We're printing your plea. Here's hoping that it gets results. Perhaps it may. But if it doesn't, keep making it as often as you can—in the press, on the platform, and through the various other media open to you.

Sincerely yours,
FRANK J. GARDNER

Canadian scoreboard for '57

IN WESTERN CANADA, in 1957, 1,064 exploratory holes were completed, 288 of these being producers and 776 being dry holes. The producers included 174 oil wells and 114 gas wells. A total of 4,920,393 ft. were drilled, 1,462,401 ft. in producers and 3,457,992 ft. in dry holes.

This means that 27.07 per cent of the exploratory holes and 29.72 per cent of the exploratory footage were successful. There were 2.36 ft. drilled in dry holes for every foot drilled in producers. For every producer completed 2.69 dry holes were abandoned. The average depth of all the exploratory holes was 4,624 ft.

Among the 701 new-field wildcats completed in western Canada in 1957, 87 were successful and 614 were dry. In other words, new-field wildcatting was 12.41 per cent successful. One producer was drilled for every 7.06 dry holes.

In eastern Canada, 145 exploratory holes were drilled, with a total of 233,400 ft. Eleven of the 145 holes were successful, nine as gas wells and two as oil wells. In these producers,

Table 1—Exploratory Drilling in Canada in 1957

Province and well classification—	Oil		Gas		Total producers		Dry holes		Grand total	
	No.	Footage	No.	Footage	No.	Footage	No.	Footage	No.	Footage
Alberta:										
Outposts	49	266,742	31	121,314	80	388,056	41	213,837	121	601,893
New-pool wildcats	25	134,291	19	101,169	44	235,460	41	186,782	85	422,242
Deeper-pool tests	3	5,511	1	100	4	5,611	10	15,176	14	20,787
Shallower-pool tests	*9	45,494	5	23,168	14	68,662	0	0	14	68,662
New-field wildcats	*23	148,292	29	184,667	52	332,959	289	1,517,983	341	1,850,942
Total	109	600,330	85	430,418	194	1,030,748	381	1,933,778	575	2,964,526
British Columbia:										
Outposts	3	16,414	10	62,274	13	78,688	5	22,368	18	101,056
New-pool wildcats	1	7,293	1	7,906	2	15,199	2	15,602	4	30,801
Deeper-pool tests	0	0	1	3,745	1	3,745	1	609	2	4,354
Shallower-pool tests	1	4,419	1	2,729	2	7,148	0	0	2	7,148
New-field wildcats	1	4,553	11	65,595	12	70,148	23	146,024	35	216,172
Total	6	32,679	24	142,249	30	174,928	31	184,603	61	359,531
Manitoba:										
Outposts	3	6,452	0	0	3	6,452	3	6,743	6	13,195
Deeper-pool tests	0	0	0	0	0	0	2	1,737	2	1,737
New-field wildcats	1	2,752	0	0	1	2,752	66	180,286	67	183,038
Total	4	9,204	0	0	4	9,204	71	188,766	75	197,970
Northwest Territories:										
New-field wildcats	0	0	1	2,672	1	2,672	7	17,203	8	19,875
Total	0	0	1	2,672	1	2,672	7	17,203	8	19,875
Saskatchewan:										
Outposts	20	88,531	3	8,268	23	96,799	29	117,452	52	214,251
New-pool wildcats	14	60,662	1	2,286	15	62,948	26	109,602	41	172,550
Deeper-pool tests	0	0	0	0	0	0	2	4,788	2	4,788
New-field wildcats	21	85,102	0	0	21	85,102	229	901,800	250	986,902
Total	55	234,295	4	10,554	59	244,849	286	1,133,642	345	1,378,491
Total Western Canada:										
Outposts	75	378,139	44	191,856	119	569,995	78	360,400	197	930,395
New-pool wildcats	40	202,246	21	111,361	61	313,607	69	311,986	130	625,593
Deeper-pool tests	3	5,511	2	3,845	5	9,356	15	22,310	20	31,666
Shallower-pool tests	10	49,913	6	25,897	16	75,810	0	0	16	75,810
New-field wildcats	46	240,699	41	252,934	87	493,633	614	2,763,296	701	3,256,929
Total	174	876,508	114	585,893	288	1,462,401	776	3,457,992	1,064	4,920,393
Ontario:										
Outposts	0	0	6	7,842	6	7,842	11	14,910	17	22,752
New-pool wildcats	0	0	1	1,600	1	1,600	19	25,004	20	26,604
Deeper-pool tests	1	111	0	0	1	111	1	1,010	2	1,121
New-field wildcats	1	3,160	1	1,518	2	4,678	85	123,939	87	128,617
Total	2	3,271	8	10,960	10	14,231	116	164,863	126	179,094
Quebec										
New-field wildcats	0	0	1	2,198	1	2,198	18	52,108	19	54,306
Total	0	0	1	2,198	1	2,198	18	52,108	19	54,306
Total Eastern Canada:										
Outposts	0	0	6	7,842	6	7,842	11	14,910	17	22,752
New-pool wildcats	0	0	1	1,600	1	1,600	19	25,004	20	26,604
Deeper-pool tests	1	111	0	0	1	111	1	1,010	2	1,121
New-field wildcats	1	3,160	2	3,716	3	6,876	103	176,047	106	182,923
Total	2	3,271	9	13,158	11	16,429	134	216,971	145	233,400
Total Canada, all classes	176	879,779	123	599,051	299	1,478,830	910	3,674,963	1,209	5,153,793

*Includes dually completed gas wells

16,429 ft. were drilled. Of the 145 holes, 7.6 per cent were successful; 7.04 per cent of the exploratory footage was in successful holes. For every foot drilled in producers, 13.21 were drilled in dry holes. The average depth of hole was 1,610 ft.

Among the 106 new-field wildcats completed in eastern Canada in 1957, 3 were successful and 103 were dry. In other words, new-field wildcatting was 2.83 per cent successful. One producer was drilled for every 34.33 dry holes.

Total new-field wildcats in Canada drilled during 1957 were 807, of which 90 were successful and 717 were dry holes. New-field wildcatting for Canada was 11.15 per cent successful during 1957 or one producer for every 7.97 dry holes. Of the 807 new-field

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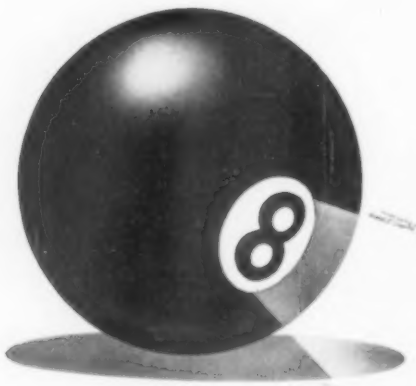

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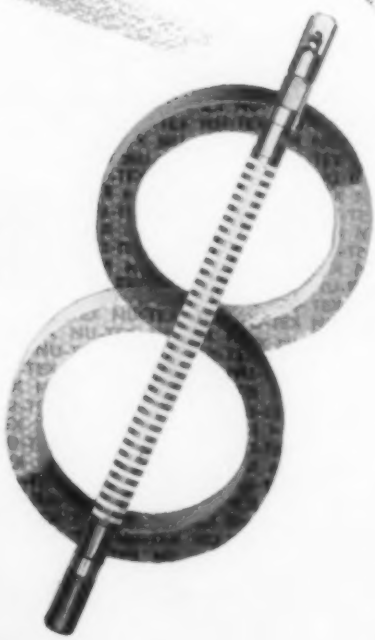

BMW

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wildcats drilled, 752 were drilled on a technical basis as follows:

Twenty-two producers and 281 dry holes were located on geology.

Thirty producers and 179 dry holes were located on geophysics.

Thirty producers and 210 dry holes were located on both geology and geophysics.

Technical methods, therefore, were 10.9 per cent successful in finding new oil or gas fields.

This is an abridged version of the preliminary report of the comittee on geophysical activity of the Society of Exploration Geophysicists, of which Homer G. Patrick is chairman. The full report will appear in Geophysics, official publication of SEG.

Western Canada led '57 exploration

Table 2 shows the number of crew-months geophysical operations in the provinces of Canada, as well as a breakdown of the operations according to company-owned and contract crews.

As in past years, by far the greater portion of the Canadian geophysical work was done in the provinces of Alberta, Saskatchewan, and British Columbia. Alberta ranked first with 884 crew-months seismic work and 32 crew-months gravity work; Saskatchewan with 260 crew-months seismic work and 6 crew-months gravity work ranked second; and British Columbia with 149 crew-months seismic work ranked third. Contract geophysical companies did 75.6 per cent of the seismic work and all of the gravity work in Canada in 1957.

This abridgement of the report of the chairman of the AAPG Committee on Statistics of Exploratory Drilling, presented before the business committee at the association's annual meeting in Los Angeles, March 10-13, is published by special permission of the author and AAPG. The full report will be published in the June 1958, Bulletin of the AAPG.

TABLE 1—GEOPHYSICAL CREW-MONTHS IN CANADA—1957

	Seismic		Gravity		
	Company	Contract	Company	Contract	Total
Alberta	247	637		32	916
Saskatchewan	57	203		6	266
British Columbia	15	134			149
Manitoba		3			3
Northwest Territories		4			4
Ontario				34	34
Quebec				7	7
Nova Scotia				2	2
Prince Edward Island		8			8
Subtotal	319	989		81	1,389
Total	1,308		81		1,389

Upper Texas coast drilling on rise

NEW EXPLORATION in Chambers County, on Texas' upper coast, is resulting in a succession of significant discoveries and extensions. These are opening the way for a further stepup in drilling in this county, now the most active in the upper coastal area.

Most recent discovery is a mile extension of the expansive Fishers Reef field, offshore in the upper arm of Galveston Bay. This extension is southeast of production, where Humble Oil Refining Co. completed its 50-C Galveston Bay State making 318 bbl. of 55.2°-gravity oil with 27 M.M.c.f. of gas per day from a Frio sand at 8,698-8,712 ft. Hole was drilled to 9,350 ft.

Standard Oil Co. of Texas got a large wet-gas well in another offshore extension at Robinson Lake field, on the south bay shore of the county. The well, in State Tract 190, in the extreme east arm of Galveston Bay, established an absolute open-flow potential of 127 M.M.c.f. of gas per day. Gas carries 24.2 bbl. of condensate per 1 M.M.c.f. Its pay is perforated in two intervals at 10,212-40 ft.

The North Willow Slough area, in the eastern inland portion of the country, also figures in the new development with a large-volume gas and condensate well. It is Kilroy Co.'s 3 Janet McCarthy, which opens a new Marginulina reservoir east of previous production, and between it and the nearby large Fig Ridge field. Kilroy's well is rated at 128 M.M.c.f. of gas per day on absolute open-flow. Condensate decovery is at the rate of 15 bbl. per 1 M.M.c.f. The new pay is perforated at 7,948-65 ft.

The new pay is one of two zones in which this well is completed. The other is a Frio oil sand, perforated at 8,416-22 ft., from which the well flowed more than 141 bbl. per day through 5/32-in. choke.

The Texas Co. also has another new oil producer in the 8,400-ft. zone in the same field. Its well, 3-A Connerly, flowed 14 bbl. of clean oil while open 80 minutes through 5/32-in. choke. It is perforated at 8,412-17 ft. It also is productive of gas and condensate from a shallower sand, perforated at 7,956-60 ft. and 7,966-71 ft. The 8,400-ft. sand now has five good oil producers.

Southwest of production in Stowell field, in the extreme northeastern corner of the county, Meredith & Co. is opening a new Frio oil reservoir at its 1 Kaiser et al. The well flowed 193.84 bbl. per day through ⅛-in. choke under pressure of 1,125 psi. Its pay is perforated at 8,434-40 ft. in hole drilled to 9,131 ft.

Chambers County now has nearly 20 active operations, scattered over 17 different fields and areas.

Indiana's shallow play continuing

A SHALLOW oil play that began about 9 months ago in Gibson County, Indiana, is still going strong. Nine wells have been completed by Kelley-Conrad-Kaye Drilling Co. in Sections 8 and 17-3s-9w, 5 miles south of Francisco. All had potentials of up to 200 or more barrels of oil per day in the Hardinsburg or Jackson sands.

A current new prospect in this area is Faith Oil Co. and Art Fritz 1 Heironimus in SW SE NW 4-3s-9w. The operators are running casing to test the Jackson sand at 1,554-67 ft.

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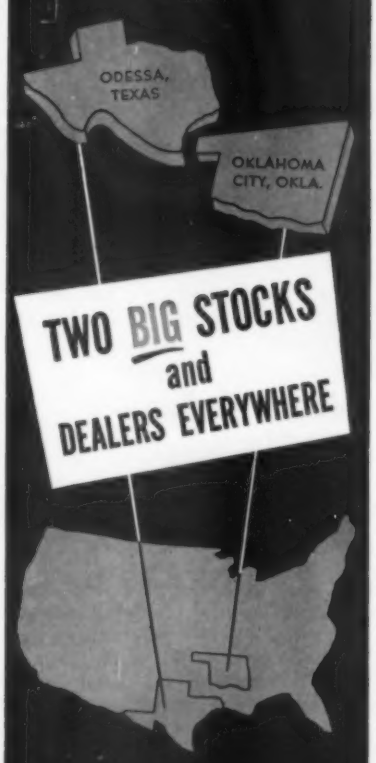

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California wildcats create new interest

SEVERAL recently announced wildcats point up a renewed interest by operators in the Newhall-Potrero-Saugus-Placerita area of northern Los Angeles County.

The most significant will be an 18,000-ft. wildcat programed by Sunray Mid-Continent Oil Co. for the Newhall-Potrero field. This deep test, which could easily go to 20,000 ft. according to a Sunray spokesman, will seek the field's tenth zone.

The drill site of the wildcat, 147 R.S.F., is on the Newhall structure and about 1,800 ft. northeast of the nearest field producer. It is also only a little more than 2,000 ft. south of the nearest well in the Castiac Junction field.

If the well goes to 20,000 ft., it will be the second-deepest test drilled in the state. The record holder is Ohio Oil Co.'s 21,482 ft. dry hole in the Paloma field of Kern County abandoned in 1955. It's virtually a cinch to break the Los Angeles County record now held by Shell Oil Co. 48A Alamitos in the Long Beach field at 14,950 ft.

Another interesting development involving this same general area was the announcement by Union Oil Co. of California that it has blocked out 500 acres of land for drilling southeast of the town of Saugus. This is about 3 miles south of Newhall-Potrero and 5 miles west of the old Placerita oil field.

To the south some 8 miles, General Petroleum Corp. was drilling a 14,000 ft. test in the aqueduct area of north San Fernando Valley. At last reports, GP was fishing stuck drill pipe at 3,411 ft. The depth of the hole was 5,006 ft.

About 1 mile northeast of Saugus, Edward Lustgarten was testing shows in 1 Lucky Lusty at 2,260-2,330 ft. Four miles to the east, Langlois Brothers was abandoning a 1,069 ft. wildcat. The Langlois test was in the Mint Canyon area of the old Placerita oil field.

RMAPG will look at Colorado's rocks

The Rocky Mountain Association of Petroleum Geologists plans a symposium on the Pennsylvanian rocks of Colorado and adjacent areas this autumn. A field trip will be held in conjunction with the symposium which will cover Pennsylvanian exposures in northwestern Colorado.

Metropolitan Albuquerque, the financial and communications center nearest to New Mexico's important oil, gas, and uranium activities, is being selected as headquarters or for branch offices, by more and more companies interested in these developments. The Albuquerque National Bank has officers and directors who are thoroughly experienced in these fields—they are at your service for information and consultation. Please address inquires to Dept. 139.

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The symposium will be presented in guidebook form.

The symposium guidebook will offer good coverage of the Pennsylvanian stratigraphy of the Paradox basin, northwestern Colorado, and eastern Colorado. The field conference itself will tour the Maroon basin in northwestern Colorado. Field conferences will look at surface exposures of typical basin-center sediments and typical basin-rim or shelf sediments, with particular attention to interesting carbonate and hydrocarbon developments.

Tentative dates for the caravan-type trip are September 18-20.

Bonanza Setting Pipe In Nevada Wildcat

Bonanza Oil Corp. was reported setting pipe in their 1,345 ft. wildcat located 10 miles southeast of Las Vegas after the well had a mild gas blow and oil shows were bailed.

Illinois' Rose Hill picks up good well

JASPER COUNTY, Illinois' new Rose Hill area picked up another good well. Sam Tipps 2 Charles H. Woodard, SE NE SE 32-8n-9e, got 550 ft. of clean oil on drill-stem test of the zone at 2,790-2,850 ft. A test at 2,845-64 ft. got 780 ft. of oil and 30 ft. of oil-mixed mud. The Rosiclare and McClosky will be tested at 2,830-37 and 2,851-63 ft., respectively.

This new producing area is located 5 miles west of Rose Hill, Ill., and looks like it may develop into a good play. The area has been one of the most active in the Illinois basin in recent weeks.

Illinois fields extended

NO NEW POOLS were discovered in Illinois in February, but there were three extensions to oil and gas pools.

There was one extension to Olney South pool in Richland County and two extensions to Freeburg South pool in Saint Clair County. The two extensions to Freeburg South pool are gas wells.

Drilling activity in Illinois in Febreuary was the lowest in several years. A total of 148 wells were completed during the month as compared with 168 in February 1957, and 191 in February 1956. The 148 completions include 71 oil wells and 5 gas wells, or 51 per cent successful.

Since about 6 months ago when Chesterville East pool in Douglas County was at the peak of its development, there has been no area of outstanding drilling activity or development in Illinois except for the Gila pool area in Jasper County where the completion of a good producer in January gave rise to hopes that a new area of major interest had been discovered. Although there has been a flurry of drilling activity and several good wells have been completed since the original one, it is still too early to know whether the initial hopes for the area will be realized.

The estimated production for February is 6,552,000 bbl., as compared with 6,081,000 bbl. actual production in February 1957.

Three Illinois areas add new pools

NEW DISCOVERIES and extension wells featured development news in the Illinois basin. In Saline County, Slagter Producing Co. 1 Cecil Simpson, 4 miles northweast of Harrisburg in NE SW NW 30-8s-6e, is shut in for tankage after flowing 12 bbl. of oil hourly on 3/8-in. choke from the Aux Vases - Mississippian lime at 2,833-41 ft.

In Richland County, 4 miles south of Olney, Ring & Kinsell 1 L. V. Kurtz, SE NW NE 28-3n-10e, is com-

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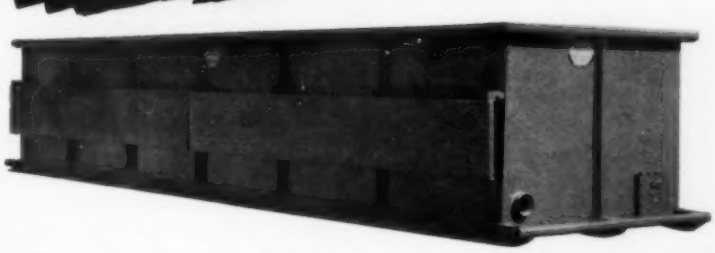

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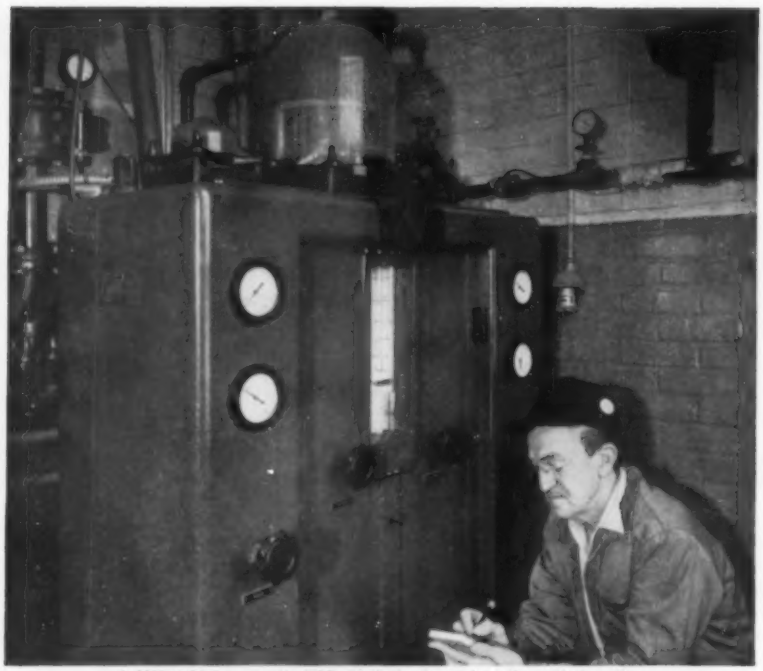

A 6000#/24 hr. capacity W&T chlorinator is used on the central cooling water system at Marcus Hook, Penna. refinery of Sinclair Refining Company.

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For information about W&T chlorination for slime elimination write for Bulletin CD-43.

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plete. The operator pumped 110 bbl. of oil per day from the McClosky lime at 3,167-72 ft. after acid treatment.

In Wabash County, Robert Z. Morris is taking production tests at his new 1 Henry J. Bosecker discovery in SE NW SW 4-1s-13w. This one pumped 135 bbl. of oil per day on tests of the Benoist-Bethel sand at 2,521-36 ft. Location is 5 miles northwest of Mount Carmel.

Newly opened Gila pool was extended by Sam Tipps at his 1 Charles H. Woddard in Jasper County, NE NE SE 32-8n-9e. This well, 4 miles west of Rose Hill, pumped 312 bbl. of oil per day from the Rosiclare sand, natural, at 2,834-45 ft. and the McClosky at 2,845-53 ft.

Oil production opens inside Kansas' Hugoton

Chester-Mississippian oil production was opened inside shallow Hugoton gas field in Haskell County, southwestern Kansas. The discovery well is Helmerich & Payne, Inc. 1 Eubank, NW NW NW 28-28s-34w.

Production tests now under way at the discovery got as much as 16.7 bbl. of oil per hour from the Chester at 5,439-45 ft. The new pool-opener is south of Pleasant Prairie field, and west of Santa Fe, Kans.

Quiet Salina Basin In Kansas Has Discovery

First discovery news out of the Salina basin in North-Central Kansas in some time is reported by General American Oil Co. The 1 Mortimer, NE NE NE 5-16s-1w, 12 miles southeast of the city of Salina, Saline County, made 14 bbl. of oil per day on pump from the Mississippian, topped at 2,625 ft.

There is very little production in this huge Mid-Continent basin, most of it being at the southern end in Saline County and nearby areas.

Wyoming's Green River in high gear

EARLIER PREDICTIONS of a big year for the Green River basin in Southwest Wyoming are holding true.

Three events of exploratory interest in this area are: success at Ohio Oil Co.'s Wamsutter Unit in Sweetwater County, gas shows at El Paso Natural Gas Co.'s confirmation try to the recent Desert Springs discovery

in the same county, and the announcement of a deep test at Pacific Creek in Sublette County by G. L. Reasor of Chicago.

...Wamsutter Unit. Ohio Oil Co. reported a gas flow of 4 M.M.c.f. per day at its 1 Wamsutter Unit in Sweetwater County. Flow is from the Mesaverde-Cretaceous at 9,878-9,956 ft. This rank wildcat, if successful, will liven exploration in the east part of the Green River basin.

...Desert Springs. El Paso reported gas shows on its way into the Mesaverde at the confirmation try, 2 Desert Springs, to its recent Desert Springs field-opener in Sweetwater County.

The discovery well, 1½ miles southeast, flowed 7,500 M.c.f. of gas daily from Mesaverde. If the confirmation well hits, a 1½-mile-long band of Mesaverde production will have been tapped.

...Pacific Creek. Announced plans for a 14,000-ft. Mesaverde test by G. L. Reasor of Chicago in the famous Pacific Creek area, Sublette County, are stirring Rocky Mountain oil circles.

No location has been reported as yet, but Reasor is unitizing a block in the area of the old Pacific Creek unit on which Superior Oil Co. put down the Rocky Mountains' deepest hole in 1949 at 20,521 ft. This well had the world's depth record for several years. This well had gas shows in the Fort Unit, Lewis, and Mesaverde.

The original Pacific Creek unit was formed in 1943, included more than 51,000 acres, and was terminated in 1949 after Superior finished up the record-breaking hole. The amount of acreage in the new unit has not been reported yet.

Dead Horse Creek Tops Its Best Well

The best producer to date in Wyoming's Horse Creek field in the Powder River basin is The California Co. 7 Government, SW NE NW 32-49n-75w, Campbell County.

The operator pumped 459 bbl. of oil daily from Parkman-Mesaverde (Cretaceous) perforations at 6,718-46 and 6,776-82 ft. This well beats by about 100 bbl. per day any previous well in the field.

The 7 Government is also at the southeast limits of the field. Location is 3 miles southeast of the discovery well of this significant Powder River basin field. Most field development has been to the northwest and southeast of the discovery.

North Texas symposium released by societies

The Geology and Geophysics of Cooke and Grayson counties, Texas, published by Dallas Geological Society and Dallas Geophysical Society. 211 pp. Price $10.

Grayson County is an area where both geology and geophysics have enjoyed notable success during the recent oil exploration and drilling campaign. Both the Dallas Geological Society and the Dallas Geophysical Society have done the industry a real service in compiling this highly informative study of a complex area where oil exploration is still carried on aggressively by both major oil companies and independents.

The societies' symposium contains valuable papers on regional geology and geophysics as well as several detailed papers on important oil fields in both Cooke and Grayson counties. The guide book contains several large scale maps; among them are a regional gravity map and a regional subsurface map that would be especially helpful to anyone interested in the two counties.

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THREE prospective discoveries have focused attention on leasing operations in this West Central Texas county.

BY CARL HOOT

Texas prospects hint big gas field

A BIG LEASING PLAY in Palo Pinto County, West Central Texas, has other operators asking "what goes?"

Three wildcats now are showing for discoveries and the western half of the county is productive in several scattered fields. Other than this activity, exploration and pool-openers have been pretty slim and far apart, at least when compared with nearby counties.

Reliable sources have pointed out an active lease play in Palo Pinto

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County that has been going on since 1956. Companies with large lease holdings in the county include Texoma Production Co., Skelly Oil Co., Mayfair Minerals, Nelson Bunker Hunt, Lion Oil Refining Co., Magnolia Petroleum Co., Sunray Mid-Continent, The Texas Co., Humble Oil & Refining Co., Southern Union Gas Co., Southern Minerals and Christie, Mitchell & Mitchell.

It is estimated that 90 per cent of the county is now under lease.

Three wildcats in Palo Pinto County are good prospects for discoveries. As of last week one was showing oil and the other two gas. All were testing sections in the Pennsylvanian.

Gas flows reported have not been big, as gassers go, running from 1 to 7 M.M.c.f., but those were the size wells which started Wise County operators into consolidating scattered production into one of the country's largest fields—the Boonesville (Bend conglomerate). This field covers 251,000 acres in Jack and Wise counties (see The Oil and Gas Journal, page 117, Oct. 14, 1957).

Wildcat reports . . . Texhoma Production Co., Amarillo, had two wells going last week, both showing for gas discoveries. Their 1 S. B. Cantey estate, 4 miles east of the town of Brad on a 640-acre lease, had made the best showing. A drill-stem test in Atoka sand at 3,663-90 ft. had gas at the surface in 11 minutes, flowing at the rate of 7,500 M.c.f. per day. Flowing pressure from 1,320-1,650 psi. Maximum shut-in pressure was 1,945 psi. in 30 minutes. Recovery when pipe was pulled included 7 ft. of mud-cut distillate. Electrical surveys were run following the test. Total depth is 4,353 ft.

Texhoma Production 1 R. D. Hinkson, on a 604-acre lease 7½ miles northeast of Strawn, was drilling ahead after recovering gas and distillate on two tests. The section was not identified.

A test at 3,323-3,514 ft., open 1 hour, had gas in 20 minutes and recovered 315 ft. of gas and distillate-cut mud. Pressure reached 110 psi. At 3,516-74 ft., open 1 hour, gas surfaced in 3½ minutes, estimated at 1 M.M.c.f. per day.

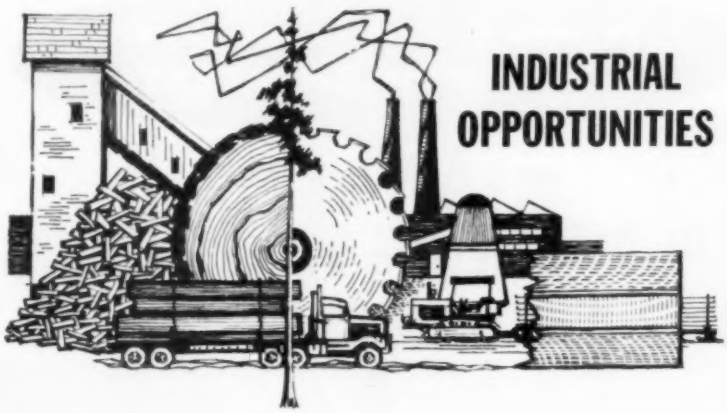
Frazier & Lohan et al 1-B Seaman estate, 5½ miles northwest of Brad, and 2 miles north of old 1,600-ft. production, had prospects of Caddo oil production. On drill-stem test at 3,235-60 ft., oil surfaced in 43 minutes. The well apparently was not allowed to flow. Pressure on the test ranged downward from 1,650-1,420 psi. A test at 3,724-82 ft., open 90 minutes, blew gas and recovered 50 ft. of gas-cut mud. Operators prepared to perforate the Caddo for further checking.

Palo Pinto County . . . One other Pennsylvanian test was scheduled at this writing. Texas Pacific Coal & Oil Co. made application to deepen its 167 Stuart to 3,500 ft. as a Strawn test. Location is in the extreme southwestern corner of the county, 6 miles southwest of Strawn.

Palo Pinto County is located on the east flank of the Bend arch, and on the west flank of Fort Worth basin. Except for scattered shallow Strawn sand drilling, the county has been inactive since the days of the Ranger and Desdemona booms in Eastland County 40 years ago.

Geologists familiar with the county believe that considerable oil and gas reserves are present primarily in the Strawn and Atoka sands.

Palo Pinto is immediately southwest of Wise County where considerable oil and gas has been found in tight Strawn sands and Atoka conglomerates. In almost all cases it has been necessary to fracture these sands in Wise County.



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North Dakota bags field opener

A NEW DISCOVERY on the Nesson anticline and extensions to a recent field opener highlighted North Dakota activity.

The new field opener is Amerada Petroleum Corp. 1 Olson, C SE SE 9-150n-95w, McKenzie County. The well flowed 274 bbl. of oil and 25 bbl. of water per day from Madison-Mississippian perforations 9,414-54 ft.

The new field is 2 miles southeast of Blue Buttes and north of Croff field near the southern end of Nesson production. An east offset, the 1 Belquist, C SE SW 10-150n-95w, is drilling below 6,217 ft.

Dimmick extensions . . . New Dimmick field in McKenzie County, west of Blue Buttes field, has two new extensions and two wells drilling.

Amerada completed the north extension, 1 Dodge, C NW SE 20-151n-96w, for 188 bbl. of oil and 11½ bbl. of water per day from open hole in the Madison at 9,316-46 ft. Flow was on 11/64-in. choke.

A south extension, Amerada and The Texas Co. 1 Kieson, C NW SE 29-151n-96w, made 189 bbl. of oil and 69 bbl. of water per day on 16/64-in. choke from open hole in the Madison at 9,310-24 ft.

The same operators are busy southeast and east of the field. Drilling is below 6,043 ft. at the 1 Kieson, C SE SE 29-151n-96w; east of the field discovery well the 1 Westergaard, C NW NE 20-151n-96w, is below 5,182 ft.

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New Madison strike in North Dakota

NORTH DAKOTA'S border county Mississippian play continues to flourish. Burke County has a new producing area at Northern Pump Co. 1 Bywater, NE NE SW 34-163n-92w.

The well flowed 120 bbl. of oil on a 12-hour test on 16/64-in. choke from perforations in the Madison at 6,210-40 ft. The operator has shut in the well for storage.

Location of this new Burke County discovery is 3 miles south of Rival field and 3 miles west of Lignite field.

Sour gas found in Ohio's Moreland pool

Sour gas is being found in the Newburg sand 500 ft. above the prolific Clinton sand in Moreland pool in Franklin Township, Wayne County.

A west extension, the 3 Raymond Baker, widens the present productive area to 1 mile. The operator, Ohio Fuel Gas, reported the gasser as gaging 2,750 M.c.f. natural from two horizons in the sand, logged at 3,020-83 ft.

Montana's Disturbed Belt reawakening

IS THE Disturbed Belt of Montana coming back on the exploratory scene?

Northern Natural Gas Producing Co. may have the answer at its 1 Blackleaf-Federal A in Teton County, Montana.

The company reported a gas flow of 3,300 M.c.f. per day at its well on drill-stem test of the Mississippian at 3,768-3,828 ft.

Success at this wildcat will bust the dormant Disturbed Belt drilling on the U.S. side of the Rockies wide open. Alberta is busy developing prolific Mississippian gas reserves just a few miles to the north at Waterton Park, Castle River, and other areas up the length of the mountains. The U.S. side of this play has met with failure each time a well has been put down.

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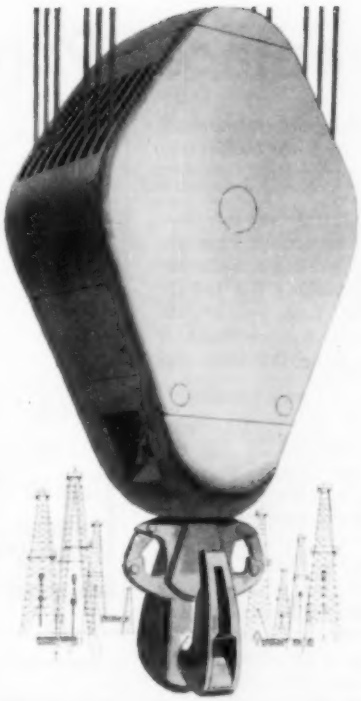

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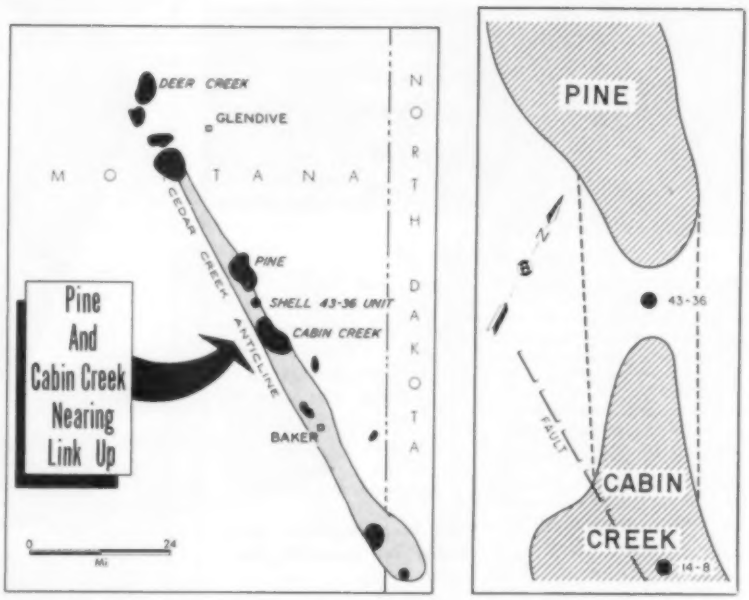
Pine replaces Poplar as Montana's big producer

PINE UNIT field is now Montana's biggest producer . . . an honor formerly held by Poplar field, another Williston basin giant.

According to Petroleum Information, Denver, production at Pine averaged more than 14,000 bbl. per day last year, surpassing the former Poplar field total. Last year's total production at Pine was more than half the total output since the field discovery in 1952.

History . . . Shell Oil Co. discovered Pine Unit at 1 Unit in SW SW NE 30-12n-57e, Wibaux County. This well flowed 467 bbl. of oil and 148 bbl. of water per day from perforations at 8,940-70 ft.

Pine Unit covers 45,909 acres in the center of the long Cedar Creek anticline, a prominent Williston basin boundary structure. Acreage in the unit covers parts of Dawson, Prairie, Wibaux, and Fallon counties. Pine is operated by Shell Oil Co., that company's participating interest being 87.82 per cent. The Texas Co. has 11.31 per cent interest in Pine; Continental Oil Co. has 1.41 per cent.



MONTANA has a new leader in production, Pine unit, in the Cedar Creek anticline, birthplace of pre-Madison production in Williston. In map at right (reprinted from Rocky Mountain Echo) area within dotted lines will be developed as result of Shell's new discovery at 43-36 unit.

Development . . . The field is 20½ miles long, northwest-southeast along the anticline. It is 5½ miles east-west at its widest point in Wibaux County.

Drilling was slow in Pine Unit until 1955 when the Butte pipeline came into the area. The field went on pipeline production in September of that year with a daily average output of 3,000 bbl., according to Petroleum Information.

This pipeline outlet stirred activity. During 1955, 25 wells were completed in the Wibaux County portion of the unit. In 1956 Pine was extended southeast into Fallon County. The Fallon discovery was followed by seven successes in that area in 1956. During that same year the entire unit added 42 new wells, 2 of them wildcats in Prairie County.

The Prairie County discovery was Shell's 24-2B Unit, NW SE SW 2-12n-56e. That well, 4 miles northwest of previous production, made 243 bbl. of oil and 65 bbl. of water daily from Siluro-Ordovician. Last year this area was extended, but there are several failures between here and Wibaux County production. Production was found last year in the northwest corner of the unit in Dawson County at Shell's 12-12-D Unit, NW SW 12-13n-55e. That well made 220 bbl. of oil and 18 bbl. of water per day on pump. Total 1957 count of completions in the field (Petroleum Information) was 31 wells.

Pay zones . . . There are about 116 wells in the unit capable of producing from Siluro-Ordovician. The main, or "A" area, is in Wibaux and Fallon counties. The "B" and "C" zones are in Prairie County, and the "D" area is in Dawson County.

The field was originally developed on an 89-acre spacing. Now Shell is filling in on a 40-acre pattern within the central portion of the main, or "A" area.

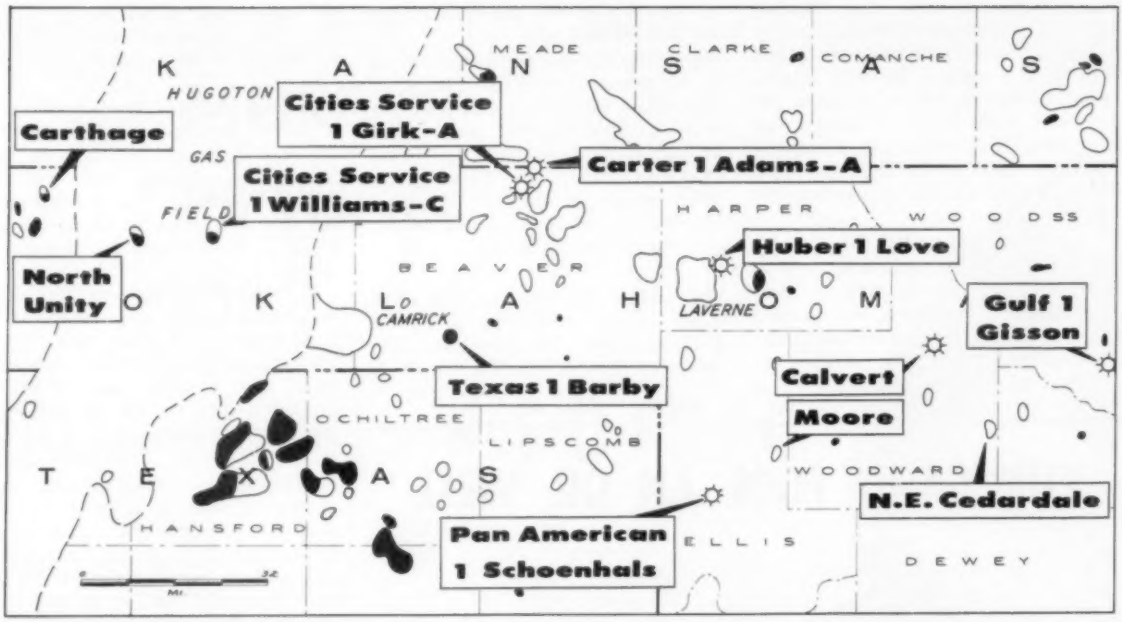
Pine Unit Field, Montana
1957 production . . . 5,468,000 bbl. (14,000 bbl. per day).
Cumulative production . . . 10,916,000 bbl.
Estimated reserves . . . 33,984,000 bbl. (January 1, 1958).
Proven acreage . . . 8,800 acres.
Producing wells . . . 111.

Cabin Creek Field, Montana
1957 production . . . 3,027,000 bbl.
Cumulative production . . . 5,536,000 bbl.
Estimated reserves . . . 39,464,000 bbl.
Proven acreage . . . 6,000 acres.
—The Oil and Gas Journal, Jan. 27, 1958.

The future . . . A recent Shell outpost discovery between Pine and Cabin Creek at 43-36 Unit hints probable linking of these two important southwest Williston fields. The 436-36 Unit discovery flowed 543 bbl. of oil on initial production tests from two zones in the Siluro-Ordovician at 8,394-8,424 and 8,434-52 ft. Flow was on 12/64-in. choke.

Previously, there was a 2-mile gap between the two fields. A look at the accompanying map shows that the east part of Cabin Creek is separated from the west side by a fault. The 43-36 discovery is on the downthrown fault block. Last summer Shell completed the 14.8 Unit as the discovery well of the northeast part of Cabin Creek field. Since then other wells have been drilled north of 14-8 toward Pine. The 43-36 discovery is the fourth and latest addition. A southwest offset is now under way at 43-36.

It seems quite evident that future development drilling on Pine's southeast side and Cabin Creek's northeast side will join the two reservoirs. However, the two fields will continue to develop under separate agreements since they are in two different federal units.



With action like this all over the state . . .

Oklahoma drilling rebounds

BY JOHN C. McCASLIN
District Editor

DESPITE CUTBACKS in drilling in most U. S. areas, Oklahoma activity is on the rise for the first time in nearly 3 years.

Completions, both wildcat and development, are above the same period last year. This fact, plus important exploratory development in many counties in all portions of the state, promise another banner year for wildcatting in Oklahoma. Discoveries during the first 2 months of this year in the northwest, west, south, south-central, and southeast point to important development work in the next few months.

The northwest . . . The Oklahoma Panhandle and northwestern counties hold sway over exploratory interest in the state. New pre-Permian discoveries in this section continue to open the new oil and gas province that has kept wildcatters' eyes on the northwestern Anadarko basin for many months.

. . . Beaver County. The Texas Co. uncovered an important Checkerboard-Pennsylvanian reservoir in the southern part of this Panhandle county at its 1 Barby, NW NW 10-1n-22eCM. The rank wildcat recovered 4,110 ft. of oil on drill-stem test at 6,031-53 ft. This Texas Co. strike opens a new area in southern Beaver County that has seen little drilling since Dower and Elmwood fields were opened about 3 years ago.

● Other Beaver events include a Carter Oil Co. discovery near Forgan at 1 Adams-A, NE SE 12-6n-24eCM. This Morrow well flowed 1,920 M.c.f. of gas per day from perforations at 5,826-48 ft.

● Cities Service Oil Co. 1 Girk-A, NW NW SE 33-6n-24eCM, flowed 29 M.M.c.f. of gas per day from the Cottage Grove-Pennsylvanian at 3,212-64 ft.; 3,360 M.c.f. per day from the Mississippian - Chester at 6,210-70 ft.

. . . Texas County. The first oil well in a new deep gas area inside shallow Hugoton field is Cities Service 1 Williams-C, SE SE NW 15-4n-15eCM. The flow rate was 50 bbl. per hour and 2,800 M.c.f. of gas on ½-in. choke from perforations in the Morrow at 6,394-6,410 ft.; from 6,419-23 ft. it made 190 bbl. of oil per day and 650 M.c.f. of gas.

● Carthage field, a new deep Morrow area in the northwest corner of the county, was extended by Graham-Michaelis Drilling Co. The well, located in SW SE 35-6n-10eCM, flowed 4,500 M.c.f. of gas per day from 4,495-4,510 ft. This field is a high flowing Morrow oil reservoir with a high gas ratio.

● In North Unity field, inside Hugoton field, Panhandle Eastern Pipeline Co. completed its 2 Easterwood, SE SE 11-4n-13eCM, flowing 342 bbl. of oil per day from Morrow sand perforations at 6,409-13 ft.

. . . Ellis County. The newest wildcat of importance in this northwestern Oklahoma area is Pan American Petroleum Corp. 1 Schoenhals, SE NW 23-20n-25w. The well is an indicated Morrow gas discovery. Success would open the county's fourth new field in recent months.

● Final tests were made at the third discovery in the county, Pan American 1 Moore, SE NW 14-21n-23w, 7 miles southeast of Gage. This Morrow well flowed 10,651 M.c.f. of gas per day on ½-in. choke from perforations at 9,358-9,570 ft.

. . . Harper County. The Laverne district continues to add prolific wells. J. M. Huber 1 Love, a dual completion in NE SW 8-26n-24w, flowed 48 M.M.c.f. of gas per day from the Morrow sand at 6,924 ft.; from the Chester at 7,137 ft. it made 6,600 M.c.f. per day. There were other indicated pay zones in this well.

... **Woods County.** The Oakdale area of southeastern Woods County added a Cherokee discovery well. Gulf Oil Corp. 1 Gisson, SE NW 33-24n-13w, flowed 16 bbl. of distillate per day and 2,700 M.c.f. of gas per day on completion from the Cherokee-Pennsylvanian at 6,332-50 ft. Gulf also tried for Chester production, but failed.

... **Woodward County.** This county added its seventh producing area at a Calvert Drilling Co. well 15 miles northeast of Woodward, and found a new pay zone at its Northeast Cedardale field.

The new Calvert discovery opens Woodward's seventh pre-Permian gas and gas-distillate area.

Shell Oil Co. opened Mussellem pay in Northeast Cedardale field at its 1-24 State, SW NE 24-22n-17w. Pay is at 6,310-62 ft. The well flowed 30 bbl. of distillate and 6,200 M.c.f. of gas per day. It also flowed 8,400 M.c.f. of gas per day from the Chester, the regular pay in this eastern Woodward County field.

The west ... North Carter field added a second pay zone at Shell Oil Co. 1 Patten, NW SE 9-9n-22w. The discovery flowed 156 bbl. of oil, 20 bbl. of water, and 196 M.c.f. of gas per day from 8,705-26 ft.; 2,700 M.c.f. of gas per day from 8,838-79 ft. Regular field pay is the Springer.

The south ... Oil Creek production is gaining importance in Love County's recently-opened Enville area. The Texas Co. 1 Spring, NW NW SE 7-7s-3e, flowed 233 bbl. of condensate per day with 3,110 M.c.f. of gas on 13/64-in. choke from this Ordovician sand at 8,560-85 ft.

... **Marshall County.** A thick Bromide sand section was uncovered at L. M. Powell 11 Godfrey, NW NE SE 31-5s-6e, in the Aylesworth-Madill trend. Logs indicate a possible 140 ft. of pay sand in the second and third Bromide-Ordovician sands.

South-central ... Gulf Oil Corp. has completed what is being called the state's first major oil discovery of 1958, the 1 Beard in McClain County. The wildcat, located in SW NE 18-5n-3w, flowed 15 bbl. of oil per hour and 676 M.c.f. of gas on 12/64-in. choke from three zones in the Ordovician: the Tulip Creek at 11,004-24, the second Bromide at 10,850-91 ft., and the first Bromide at 10,714-50 ft. This important trizone strike is west of Payne. Its big potential accentuates the growing importance of the Ordovician in south-central and southern Oklahoma.

Southeast ... A recent dual-zone gas discovery in the Raiford area of McIntosh County is reviving exploratory interest in the northwest corner of the McAlester basin. Southern Union Gathering Co. 1 Bartleson, NE SW NE 19-9n-15e, found 9 M.M.c.f. of gas per day from perforations in the Cromwell sand at 4,250-90 ft., then went into the Hunton lime to tap more production at 4,960 ft.

Major County Field Has Northeast Extension

The old Northeast Seiling field in the southwest corner of Major County in northwestern Oklahoma is in line for a northeast extension. The indicated discovery is Calvert Drilling Co. 1 Bensh, C SW SE 27-20n-16w.

A drill-stem test in the Chester-Mississippian flowed up to 10 M.M. c.f. per day from perforations at 8,372-98 ft.

Northeast Seiling was one of the first fields opened in northwestern Oklahoma. The discovery well was Continental Oil Co. 1 Kimball, NW NW SW 34-20n-16w. It was completed in 1952 in the Chester for 2,233 M.c.f. of gas per day and 134 bbl. of distillate on 15/64-in. choke. The

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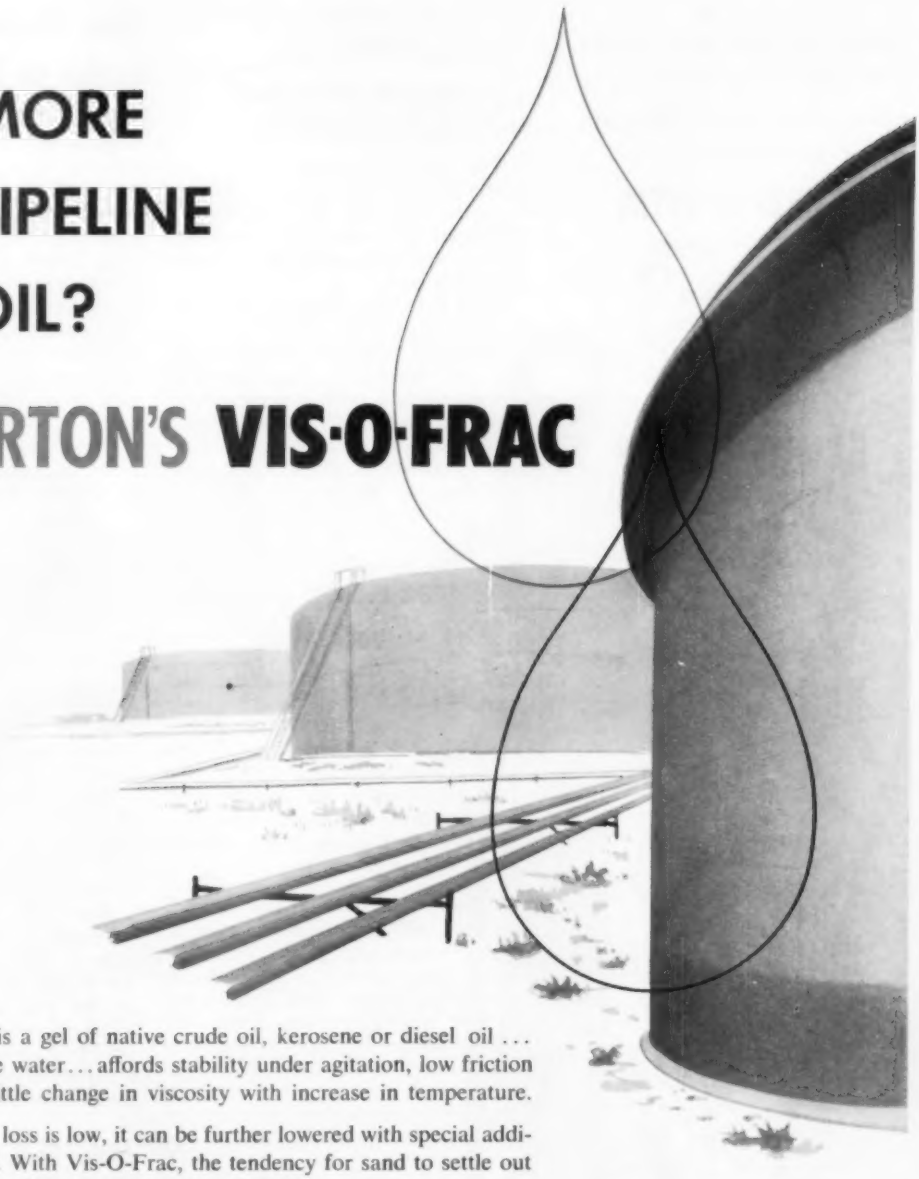

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Calvert well is the first activity around this field in 6 years.

Important Wildcat Find Indicated in Carter-Knox

The deep Ordovician play in the Carter-Knox field area of Grady and Stephens counties in southwestern Oklahoma may have an important wildcat discovery south of the main producing area.

Gulf Oil Corp. reported about 85 ft. of net pay at 15,550-70 ft. at its 1 McKinney in SE SE NW 24-2n-5w. Gas and condensate were found in the second and third Bromide sands. This well is about 400 ft. lower structurally than the Ordovician discovery well at Knox. Knox is the deepest producing area in Oklahoma with production below 15,000 ft. in most wells (below 16,000 ft. at one well).

San Juan's Bisti grows at both ends

STEPOUT DRILLING in the Bisti trend of New Mexico's San Juan basin continues to bring success. Two flowing wells were completed at each end of Bisti field itself; one flowing well was completed in the stepout area between Bisti and Blanco—the area known as the Gallegos trend, and one in the Carson area.

At Bisti . . . Humble Oil & Refining Co. and Skelly Oil Co. added good oil wells to each end of the Bisti field in San Juan County.

Humble 1 New Mexico State-AZ, C NW NW 2-24n-10w, flowed 707 bbl. of oil per day from Gallup sand perforations at 5,348-64 ft. A distance of 2 miles separates this new well with production to the southeast.

Skelly completed 7 Duff at the northwest end of Bisti in C NW SW 20-26n-13w. This well flowed 190 bbl. of oil daily from Gallup sand. There is only one Gallup well any further northwest along the Bisti trend —it is British-American Oil Producing Co.'s 1957 discovery in 13-26n-14w.

Gallegos trend stepout . . . Shell Oil Co. and El Paso Natural Gas Products Co. completed two wells in the Carson and Gallegos areas.

Shell completed 32-18 Carson Unit in C SW NE 18-25n-12w. This well flowed 304 bbl. of oil per day from the Gallup sand. It is 1 mile southwest of nearest production on the main Bisti trend.

In the Gallegos area, El Paso 2 Hickman-A, C NW SW 3-26n-12w, flowed 243 bbl. of oil per day.

Slow Michigan drilling begins to liven

MICHIGAN prospects continued to brighten with two more wildcat tests showing oil in objective horizons.

John B. Cutter 2 Cory, SE SE NE 16-16n-11w, Barton Township, Newaygo County, logged 400 ft. of oil in open hole at 3,103-05 ft. in Traverse-Alpena zone. Traverse lime was logged at 3,076 ft., 10 ft. higher than old test drilled in 1947 by Michigan Devonian Co., that completed for 60 bbl. day but later was abandoned after water invasion of producing zone.

Cutter's test was shut down at 3,105 ft. to ream reduced hole 30 ft. and set and cement 5-in. casing at 3,103 ft. Wildcat is located 6 miles northwest of Paris oil pool.

Second major development of week was on Neyer, Gallagher & Miller 1 Cotter, NW NW NW Section 5-15n-5w, Nottawa Township, Isabella County, outpost test that logged free oil below 3,100 ft. in the Dundee dolomite section. Test is located 1 mile south of Gilmore field and could develop major extension of older field or set up entirely new field.

Test is being drilled on a William H. Strickler block, farmed out. Adequate test of Dundee zone, and probable deepening, was waiting on cementing of 5-in. string.

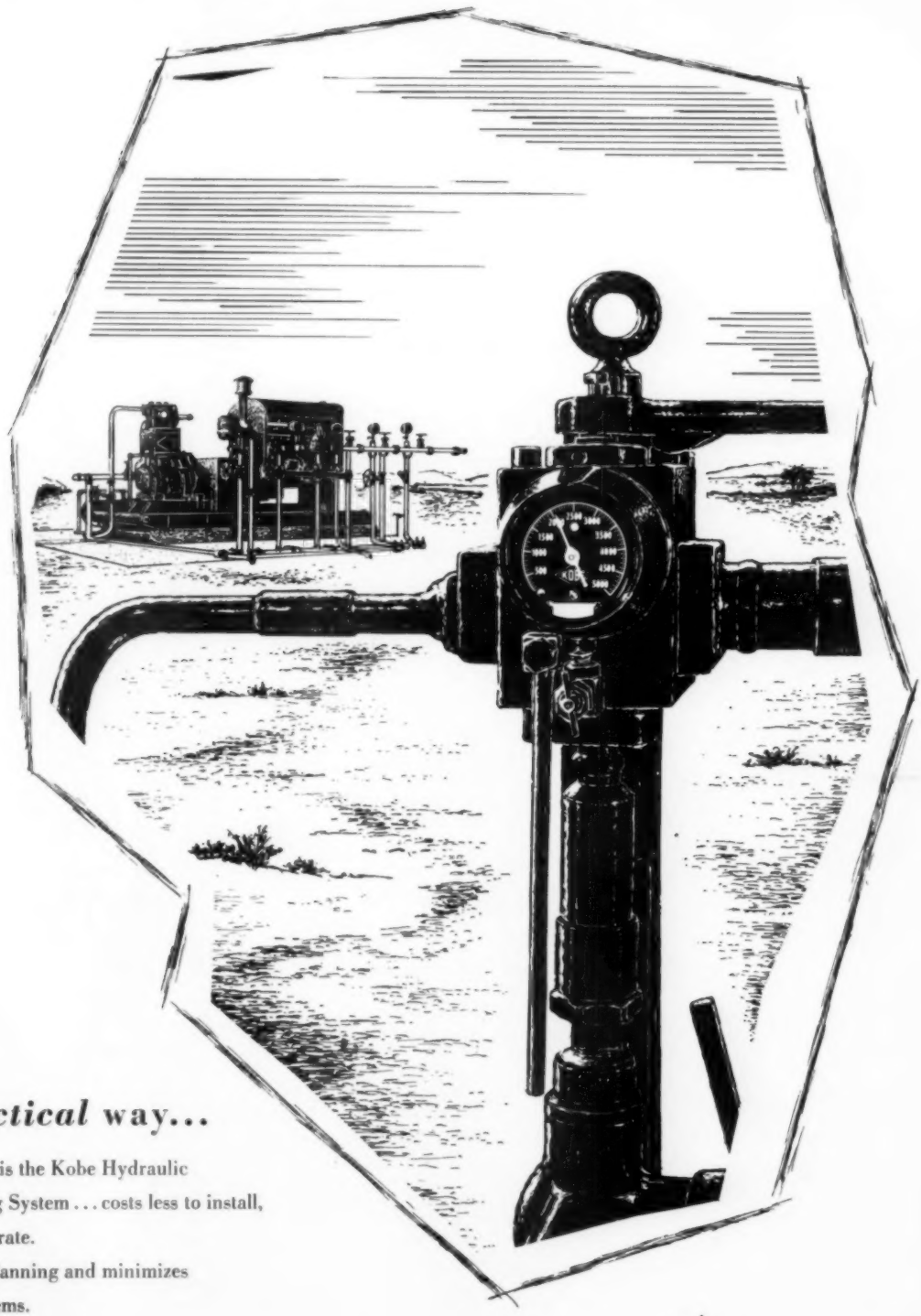
Also seen as significant for future development was successful completion of Miller Brothers 3 Harmon, NE SE SE 10-17n-17w, Mason County, for 7½ bbl. oil per hour after 1,000-gal. acid treatment to Traverse lime pay at 1,643-47 ft. It was first completion since completion of the 20-bbl.-day discovery offset.

New Strike Near Old Michigan Field

A WILDCAT test 4 miles south of the old Deerfield - Dundee Trenton lime field, Monroe County, logged good-show oil in top section of Trenton and shut down to case 5-in. string before deepening.

Potential discovery was made by Lowell Bernhardt 1 Kain, NE NW NW 30-7s-6e, Monroe County. The test logged Trenton lime objective at 1,908 ft. (elevation 689 ft.) and carried pay at 1,950-63 ft. Operator reported 200 ft. oil in open hole after 8 hours. Snow-plugged roads delayed moving casing string on location.

The interesting wildcat is showing in the same formation as the Deerfield pool, oldest Trenton lime oil field in Michigan.



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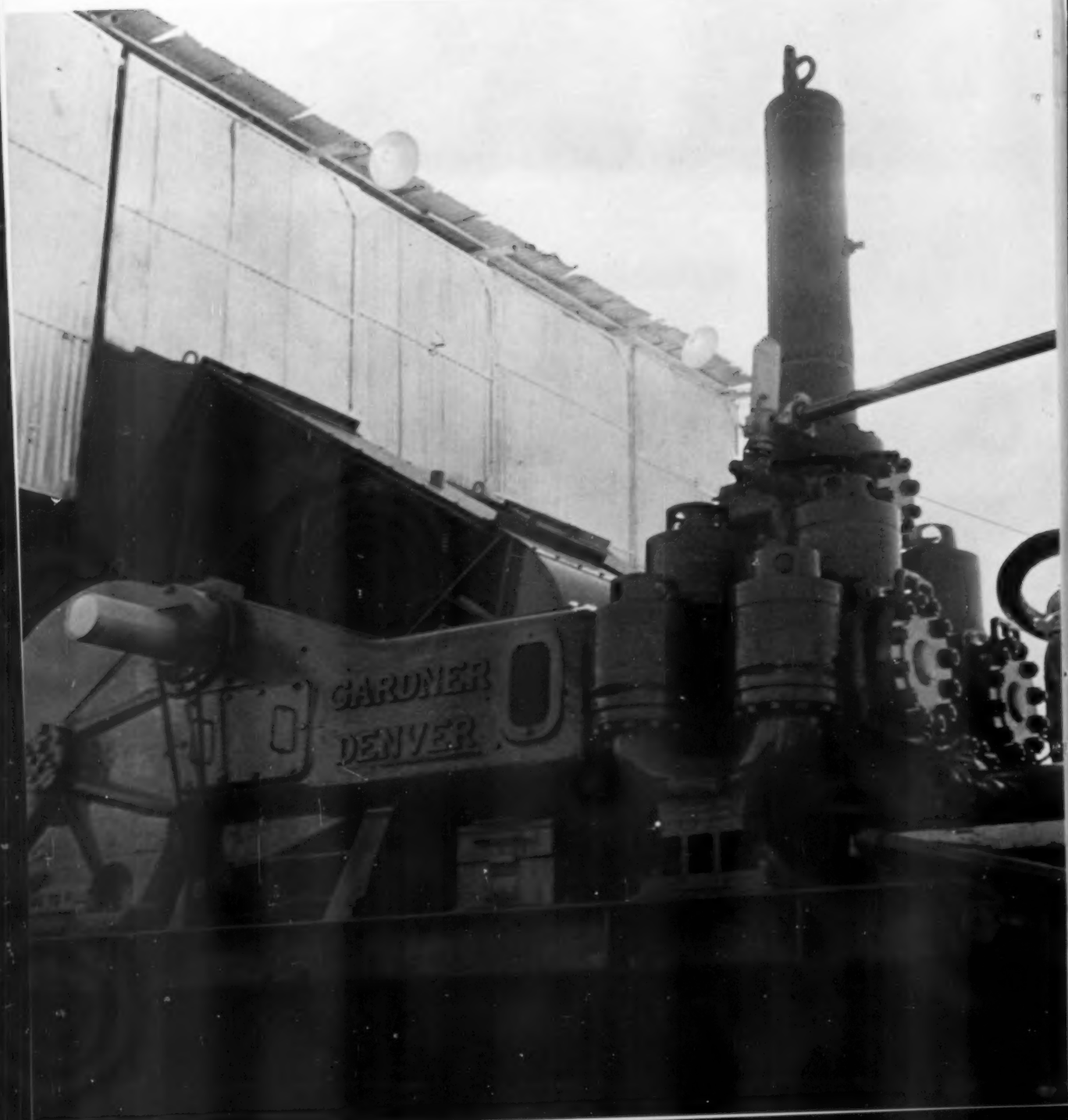

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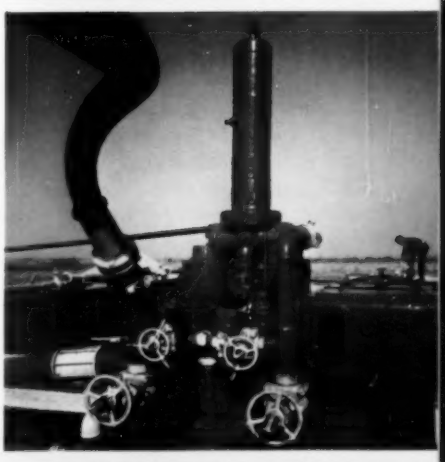

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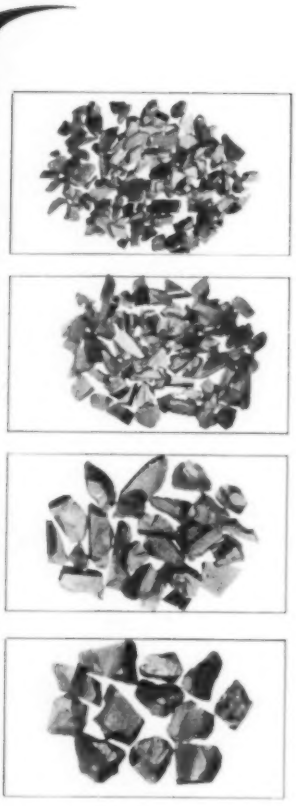

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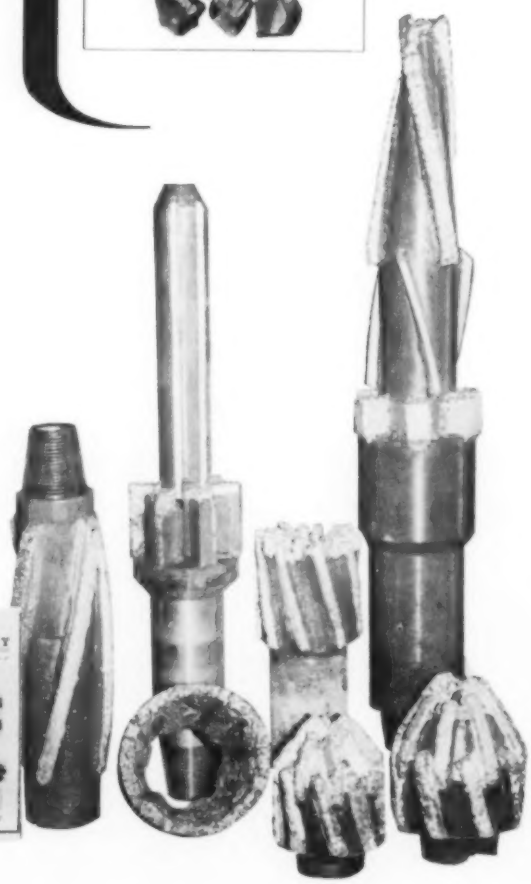

STOODY COMPANY 11960 East Slauson Avenue • Whittier, California

Two rigs active in Washington drilling

STANDARD OIL CO. of California, Western Operations, Inc., was drilling ahead below 8,648 ft. on 1 Rattlesnake Hills Unit in Benton County.

J. W. Tanner was scheduled to spud in a wildcat on a farmout from Continental Oil Co. on a site about 10 miles southeast of Chehalis in Lewis County. This is slated to be an 8,000 ft. Eocene test.

An unusual feature of this Tanner test is that arrangements have been made to conduct tests on the hole itself, in the event no production is found, to determine if it could be used for an underground natural-gas storage reservoir.

Tanner drilled the second-deepest well in the state 2½ years ago about 11 miles northwest of this latest test. Both are some 70 miles southeast of Sunshine Mining Co.'s discovery well at Ocean City.

Successful Wildcats

ALBERTA

Imperial 9-21N-39-26 Joffre, LSD 9, 21-39-26w4. D2 oil discovery. TD 6,950 ft.

Phillips A-10 Kaybob, LSD 10, 3-64-19w5. Beaverhill Lake discovery. TD 4,660 ft.

BRITISH COLUMBIA

Phillips A-1 Beatton, 31-K-NTS Map 94-A 15. Oil and gas discovery. TD 4,040 ft.

Texaco-N.F.A. 7 Boundary Lake, 33-J-NTS Map 94-A-9. Permo-Penn gas well. TD 5,346 ft.

COLORADO

Garfield County: El Paso 1 Nichols-Federal, 14-7s-99w. IP 4,200 M.c.f. of gas per day, Wasatch 914-26, 854-78 ft. TD 4,882 ft. New pool.

Mesa County: Sun Oil Co. 2 Divide Creek Unit No. 2, SE SW NE 26-8s-91w. IP 4,000 M.c.f. of gas per day, Mesaverde 4,810-32 ft. TD 5,300 ft. New pool.

Campbell-Bickling 1 Barcus, SE NE 11-2n-3w. IP 740 M.c.f. per day, Morrison 2,082-92 ft. TD 2,588 ft. South Highline Canal discovery.

Moffat County: U. S. Smelting 2-33 Gooch, 33-8n-90w. IP 4,500 M.c.f. of gas per day, Fox Mills 2,828-35 ft., 2,859-62 ft., 2,868-72 ft., 2,885-97 ft., 2,905-13 ft. TD 3,036 ft.

Logan County: Lewis Bros. 1 Hoie, C SE NW 25-8n-54w. IP 175 BOPD, 5,058-67 ft. TD 5,067 ft. New pool.

Jackson County: Continental Oil Co. 1 Sherman "B," 13-9n-79w. IP 39 BOPD, 34.2°, Muddy, 6,184-6,214 ft. TD 6,845 ft. New pay discovery.

Logan County: Skelly-Anderson-Prichard 1 Osborn, C SE NE 2-19n-55w. IP 5,700 M.c.f. of gas per day, "J" sand 5,425½-62½ ft. TD 5,545 ft. New pool.

La Plata County: General Petroleum Corp. 44-28 Butler, 28-34n-12w. IP 11,300 M.c.f. of gas per day, Paradox 9,526-39 ft., 9,550-74 ft. TD 10,026 ft.

Montezuma County: Elvis Roberts 1 Ellis, 5-35n-13w. IP 969 M.c.f. of gas per day, Dakota 969-99 ft. TD 999 ft.

CALIFORNIA

Los Angeles County: Universal Consolidated Oil Co. 3-F 20th Century Fox, 26-1s-15w, 576 BOPD, 25.5° gravity, 0.2 per cent cut, 28/64-in. choke, TD 3,729 ft. (New Miocene zone discovery in Beverly Hills field.)

SOUTH LOUISIANA

Acadia Parish: Midwest Oil Corp. 1 Lawson, 7-9s-1e. Open-flow potential 17,500 M.c.f. daily, 29 BC per M.M.c.f., 44.1°, shut-in TP 5,935 psi., perfs. 11,596-11,609 ft. (first Bolvina Mexican sand). TD 10,820 ft. (New reservoir and extension in Ellis area.)

Jefferson Davis Parish: Pan American Petroleum Corp. 1-B Lacassine, 32-11s-4w. IP 110 BOPD and 3,000 M.c.f. daily, ⅛-in., 45.2°, TP 7,750 psi., perfs. 15,044-54 ft. TD 15,510 ft. (New pay and extends South Thornwell field.)

Lafourche Parish: California Co. 1 LL&E, 41-19s-22e. Shut in gas well, ungaged, TP 3,900 psi. through ⅛-in., perfs. 11,608-32 ft. TD 12,600 ft. (New pay in Bayou Raphael field.)

LOUISIANA OFFSHORE

Eugene Island area: Sinclair Oil & Gas Co. 6-A OCS-0438, Blk. 175, Eugene Island area, Gulf of Mexico, off St. Mary Parish. IP 356 BOPD, ⅛-in., 32°, GOR 680 cu. ft. per barrel, TP 3,900 psi., perfs. 11,833-46 ft. TD 12,088 ft. (New pay and extension Eugene Island Block 175 field.)

SASKATCHEWAN

White Rose-Colorado-Paramount 12-36 Pinto, LSD 12, 36-1-5w2. Charles oil discovery. TD 5,419 ft.

British-American-Canadian Devonian 9-34X Quinn, LSD 9, 34-3-4w2. Mission Canyon oil discovery. TD 4,660 ft.

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Kreiger: Right Man, Right Job

. . . in Richfield's slant-drilling program off California. He's a former gold miner with 20 years drilling experience.

WHEN RICHFIELD OIL CORP. decided to drill 68 wells from a single acre of ground, the company had to find an expert in directional drilling to handle the job.

It did not have to look far. W. Karl Kreiger, Richfield's manager of operations, was just the man. Kreiger, 51, has spent virtually all his oil-industry career perfecting slant-drilling techniques.

Richfield will do its highly concentrated drilling from an artificial island built ½ mile offshore from Rincon, in southern California.

The company was awarded an offshore 1,175-acre state lease 2½ years ago but, unlike most other California tideland leases, this one does not touch the shore at any spot. This meant Richfield had to conduct an extensive core-drilling program from floating barges to pick out a site for the artificial island.

The island, now under construction in 45 ft. of water, will have about 1 acre of surface working space. Onshore this would make a comfortable site for one well. Kreiger's assignment will be to sink 68 holes from the little plot of man-made ground.

His credentials . . . Kreiger can dip into a wealth of 20 years' experience in tackling the job.

He recalls how slant drilling was done before World War II in a manner which would be considered difficult even with today's improved tools.

"When we drilled the Proctor & Gamble lease in the Long Beach field in 1939, we drilled through 25-ft. cylinders for 400 ft. and then kicked the holes out in different directions for proper spacing," he says. "Today, a 50-ft. cylinder is the usual practice."

One of Kreiger's chief contributions to the science of drilling came in 1947, when he helped develop the technique of penetrating vertical oil-bearing beds under a fault trap in the upper Ojai field.

Who he is . . . Kreiger is a typical "native" Californian. He wasn't born in the Golden State but has lived there most of his life.

He was born in Indian Territory near what is now Duncan, Okla., in 1906. In 1920 the family moved to San Pedro in southern California.

Some of the lure of the Gold Rush days of '49 apparently crept into his system somewhere along the line because he entered the University of California bent on a geology career with emphasis on mining.

It was during his college days he first got a taste of the oil industry. He worked the summer of 1929 in Richfield's geology department. But

Personals

Paul Weaver, professor of geology at Texas A. & M. College and consultant to Gulf Oil Corp., received the Sidney Powers Memorial medal of American Association of Petroleum Geologists at the annual AAPG meeting last week in Los Angeles. The medal recognizes outstanding contributions to petroleum geology. **John C. Ludwick, Jr.,** Gulf Research & Development Co., and **William R. Walton,** Pan American Petroleum Corp., received the President's Award as authors of the most significant paper appearing in the association's Bulletin during the year. AAPG presented certificates of honorary membership to six men: **Carroll E. Dobbin,** USGS, Denver; **K. C. Heald,** Fort Worth consultant; **William B. Heroy,** Geotechnical Corp.; **A. I. Levorsen,** Tulsa consultant; **Raymond C. Moore,** Kansas state geologist; and **Wallace E. Pratt,** Carlsbad, N. M., consultant.

Elbert L. Layman, Drumright, Okla., area production superintendent for Tidewater Oil Co., has retired.

A. V. Winther, assistant to the vice president in the El Paso, Tex., division of Standard Oil Co. of Texas, has retired. Winther has been with the company since 1928.

Byron L. Keil, field engineer for Wilson Exploration Co. in Odessa, Tex., has been promoted to engineer in charge of production and transferred to Fort Worth.

Frank R. Fisher and **C. J. Francisco** have been elected vice presidents of Sinclair Research Laboratories.

Clifford Bond and **B. F. Brawley,** Sunray Mid-Continent Oil Co. junior engineers in Oklahoma City, have been promoted to production engineers.

Donald F. Wivchar, formerly with Union Oil Co., has joined Arabian American Oil Co. as petroleum engineer on reservoir studies.

L. W. Folsom, senior geologist for Mountain Fuel Supply Co., has been advanced to manager of the company's exploration division. **W. W. Skeeters,** also senior geologist, has been named chief geologist.

he was still headed for California's gold fields, not oil fields.

After graduating with a degree in geology in 1930, Kreiger knocked around the Mother Lode country and the Randsburg gold regions in the Mojave Desert for 7 years.

This may come as a surprise to a lot of oil men, but Kreiger said he left the gold mining business and returned to the oil business and Richfield in 1937 because he "wanted to get into something more stable."

His oil career . . . After a few months in the Los Angeles home office, Kreiger launched his slant-hole drilling career at various Richfield areas like El Segundo, Wilmington, and Long Beach, where underwater bottom-hole locations and tight drill sites made such work necessary.

In 1940 Richfield transferred him to Rincon as division engineer. Here again, drilling involved bottoming wells out under the Pacific Ocean. In '44 he went back to Long Beach as drilling foreman and area superintendent. He also served a brief stint in the East Los Angeles oil field.

In 1947, Richfield tapped him to work on the tricky "fault scooping" drilling program in the upper Ojai area. This was one of the first times such a technique was used successfully. It has since gained wider use in California where extreme faulting and folding conditions occur.

Kreiger became coastal division superintendent by 1949 and, 3 years later, was back in the Los Angeles head office as assistant manager of operations. In 1955 he moved into his present post of operations manager.

He lives in Los Angeles' Baldwin Hills district near the old Beverly Hills oil field with his wife and two boys.

Donald V. Emery, production engineer, has been transferred to Denver from Carmi, Ill., by Carter Oil Co.

Alfred G. Lewis has joined Star Falcon Oil Co. as manager of operations in Arkansas, Louisiana, and Texas. He will headquarter in Dallas.

C. J. C. Leesemann has been appointed head of the supply and coordination division in Humble Oil & Refining Co.'s Houston office.

R. E. Clarke has been elected president of Pacific Oil Co. (Calif.), subsidiary of Standard Oil Co. of California. He succeeds **T. J. Galbraith,** who has retired. Clarke will continue as manager of natural-gas utilization for the parent company.

Eldon R. Baker, Gulf Oil Corp. geologist, has been transferred to Bismarck, N. D., from Billings, Mont.

Bruce E. Boswell has been promoted to senior research engineer at Shell Oil Co.'s Martinez, Calif., refinery.

R. H. (Harvey) Richardson has joined Liberty Drilling Corp. of Houston as vice president and general manager.

Dale Tull has been named process engineer in Augusta, Kans., for Socony Mobil Oil Co., Inc. He was formerly on military leave.

William P. Hegarty, formerly with Esso Research & Engineering Co., has joined Standard Oil Co. (Ind.) at the company's Whiting, Ind., research laboratories.

T. R. Fulton has been transferred by Ohio Oil Co. from Sidney, Neb., where he was plant foreman, to Tulsa, where he will be process engineer.

C. A. Houston has been named district exploration superintendent for Pan American Petroleum Corp. in Corpus Christi, Tex. **Caldwell Starkey** becomes district geologist there.

John A. Jones has left British-American Oil Producing Co., where he was junior production engineer in Sterling, Colo., to join McRae Oil & Gas Corp. as production engineer in Denver.

William H. Goryl, head of the estimating services section of Esso Research & Engineering Co.'s planning engineering division, has been given a rotational assignment as assistant director, design engineering division.

Douglas P. Bailey, manager of the operations division of The Texas Co.'s refining department, has been named manager of the purchasing department. He succeeds **Howard S. McCray,** recently named chairman of the board of Texas-Zinc Minerals Corp.

F. A. Schurtz has been transferred from Shell Oil Co.'s Lake Charles, La., office to Jackson, Miss., where he will be district production superintendent in charge of the new office there. The production office is a result of Shell's increased drilling and production activity in Mississippi.

Personals

BEN F. UHL, JR.

Ben F. Uhl, Jr., a vice president of Conorada Petroleum Corp. for more than 3 years, last week was named president. He succeeds **C. F. Dohm,** who resigned to become president of the newly formed Pan American International Oil Co. Uhl left the U. S. Bureau of Mines in 1954 to join Conorada, a foreign exploratory company owned by Amerada Petroleum Corp., Continental Oil Co., and Ohio Oil Co. In other appointments, **C. G. Flittie** has been appointed vice president, exploration. **W. F. Penniman, Jr.,** becomes vice president in charge of government relations and negotiations. Flittie, who joined Conorada a year ago, was previously with Arabian American Oil Co. Penniman, now in Paris, was a member of the petroleum policy staff of the State Department before joining Conorada in 1953.

Frank H. Schubert, formerly senior engineer with Bechtel Corp. in San Francisco, has joined G. W. Galloway Co., Arcadia, Calif., as chief engineer.

I. W. Wiseman, drilling and production foreman, has been transferred from Amerada Petroleum Corp.'s Tatum, N. M., district to the Gaines district, Seminole, Tex.

Dr. George E. Ham, formerly research director for J. T. Baker Chemical Co., has been appointed technical director of Spencer Chemical Co.'s plastics division. He will headquarter in Kansas City.

W. A. Matthews, geophysical technical supervisor for Pan American Petroleum Corp. in Tulsa, has been transferred to New York as geophysicist for Pan American International Oil Co., a subsidiary.

Dr. Earl Amott has been named senior section leader at Union Oil Co.'s Brea, Calif., research center. **Dr. L. L. Neff** and **Earle R. Atkins, Jr.,** have been appointed section leaders at Brea.

Clark P. Lattin, Jr., has been named vice president and general manager of Foster Wheeler Corp.'s process plants division. He was formerly manager of sales for the division.

Canadian Pipeline Contractors Elect Officers

C. A. Callahan, first row, center, vice president of Majestic Contractors, Ltd., is the new president of the Canadian Pipe Line Contractors' Association. Callahan succeeds R. K. Banister, first row, left, vice president of Banister-Helm, Ltd. Other officers include George Wilkinson, Vancouver, first row, right, treasurer, and second row, left to right, R. G. Murray, Jr., Dutton-Williams Brothers, Ltd., director; Robert Thomas, River Construction, Ltd., director; Gordon W. Walker, Mannix Co., Ltd., first vice president; C. A. Hooper, F. E. Shaw, Ltd., second vice president; and A. O. Ackroyd, Edmonton, executive secretary.

William M. Capps has been transferred by Amerada Petroleum Corp. from Tulsa, where he was production engineer, to Seminole, Tex., where he will be farm boss.

Fred Beyerstedt, Cling Munday, Alex Popkin, and **Roy Cottle** have been named research associates by Esso Research & Engineering Co.

W. G. Brinker, formerly consulting geologist in Billings, Mont., has joined Canadian Kewanee, Ltd., subsidiary of Kewanee Oil Co., as chief geologist in Calgary.

W. R. Purcell, manager of the chemical department in exploration and production research for Shell Development Co., has been named director of basic research in the company's reorganized exploration and production research division. **J. E. Wilson,** Denver exploration manager, is division director for exploration research. **F. Goldstone,** now manager of the exploration technical services division, becomes manager of administration and services. **B. P. Eastin,** Pacific Coast area production manager, will be director of production research. **N. D. Smith, Jr.,** vice president of Shell Development, heads the exploration and production research division.

G. E. Merritt has been named eastern district geologist in Shell Oil Co. of Canada's Regina division. **T. W. Whittingham** has been appointed western district geologist. The districts were organized this month because of expanding Shell activities.

Joseph H. Lang, assistant manager of Ohio Fuel Gas Co.'s transmission division, and **Herbert A. Titsch,** superintendent of the civil engineering and map department, have been elected assistant vice presidents of the company. Lang will be executive assistant to the vice president in charge of transmission. Titsch will be executive assistant to the vice president in charge of production and storage. **Ralph R. Wagstaff** will succeed Titsch as civil engineering department superintendent.

W. F. Bunker, Pan American Petroleum Corp.'s Oklahoma City district geologist, has been transferred to Jackson, Miss., as district exploration superintendent. **W. A. Skees,** district geologist in Corpus Christi, Tex., has transferred to Jackson in the same capacity. He succeeds **A. T. Teague,** now staff geologist in Oklahoma City. **J. W. Mason,** Wichita, Kans., district geologist, will succeed Bunker as district geologist in Oklahoma City.

Personals

Wayne C. Jenkins, foreman with The California Co., has been transferred to Venice, La., from Barataria, La.

W. M. Harris has been named Abilene, Tex., district superintendent for Magnolia Pipe Line Co. He succeeds **Vernon L. Red,** who has retired.

J. Q. Foster, F. C. Stehling, and **Lowell Westerman** have joined the research and development division at Humble Oil & Refining Co.'s Baytown, Tex., refinery.

Malcolm A. Weiss, assistant head of the cracking section in Esso Research & Engineering Co.'s process-research division, has been appointed head of the division's production-research section.

John E. Eckel, Carter Oil Co., has been elected chairman of the Mid-Continent section of Society of Petroleum Engineers of AIME. Other new officers are **William E. Stiles,** Buffalo Oil Co., first vice chairman; **Virgil Berry, Jr.,** Pan American Petroleum Corp., second vice chairman; **H. Arthur Nedom,** Amerada Petroleum Corp., secretary, and **Ernest E. Finklea,** Schlumberger Well Surveying Corp., treasurer. On the executive committee will be **Hayden Hughes,** Sunray Mid-Continent Oil Co.; **C. L. Wilson,** Sinclair Oil & Gas Co.; **David A. Wilson,** Earlougher Engineering; **Jack Reynolds,** Continental Oil Co.; and **Harold Kelly,** Phillips Petroleum Co. Ex officio members of the executive committee are **Don R. Johnson,** Warren Petroleum Corp.; **Guy F. Williams,** Dowell Incorporated; **John P. Hammond,** Amerada; **M. B. Penn,** Sunray Mid-Continent; and **Lloyd E. Elkins,** Pan American.

M. E. BODY

Murray E. Body has been appointed general manager of Tidewater Oil Co.'s operations in Turkey. He will headquarter in Ankara. Body replaces **Martin H. Mitchell,** who has moved to San Francisco as assistant to **J. Earle Gray,** head of foreign exploration and production operations. Tidewater has 3,000,000 acres under concession in Turkey held jointly with Atlantic Refining Co. and Seaboard Oil Co.

Personals

Daniel L. Hussey, former general manager of the Abadan refinery in Iran, has been appointed deputy manager of the Cologne, West Germany, refinery now being built by Esso A.G. Hussey has been with Standard Oil Co. (N. J.) subsidiaries since 1925. He is a former superintendent of Esso Standard Oil's Bayway refinery, Linden, N. J. He was named assistant general manager of Esso's East Coast manufacturing division after returning from Iran in 1955 and became head of community relations for the manufacturing department last year.

W. M. Jacobs, vice president of Pacific Lighting Corp., has been named senior vice president of Pacific Lighting Gas Supply Co., a subsidiary. He has been in charge of gas procurement for the company.

N. L. Morse, assistant chief technologist at Shell Oil Co.'s Houston refinery, has been appointed assistant chief research chemist there. **J. A. Byerly,** assistant manager of the aromatics department at Houston, will succeed Morse as assistant chief technologist.

Joseph H. Goth, Jr., senior geologist with Sohio Petroleum Co., has been named Casper, Wyo., district geologist. **Don Lessly** and **James Witherspoon,** senior geologists at Billings, Mont., have been transferred to Casper in the same capacity, and **Robert Gingrich,** Billings geologist, has also moved to Casper. The moves are part of consolidation of Sohio's northwest division exploration. Transferred to the new Billings exploration review group are **C. F. Moore, Jr.,** formerly Billings exploration superintendent, now staff geophysicist; **L. J. Larguier,** Billings division staff geophysicist, staff geophysicist; and **Donald Erickson,** Casper staff geologist, now in the same capacity in Billings. Also, **Herbert Davis,** Casper senior geologist, becomes staff geologist in Billings. **M. E. Collier** and **William Holloway** will be geophysicists in Billings. **Howard McAlister** transfers from Minot, N. D., to Billings as junior geologist. **Harold Kentta,** Billings district geologist, has been transferred to Calgary as district staff geologist. **Leonard Raible** has been transferred from Minot to Calgary as geologist. **John C. Mickelson,** Billings staff geologist, has transferred to Salt Lake City in the same capacity.

Homer E. Roberts, district supervisor for Petty Geophysical Engineering Co. in San Antonio, Tex., has been transferred to Denver as head of the company's new office there.

Murray C. McKinnon, engineer trainee with General Petroleum Corp., has been promoted to junior petroleum engineer in Santa Fe Springs, Calif.

H. Edward Wolf, formerly a consultant, has been appointed president of Erie Natural Gas Co., Inc., Erie, Pa. The company has production in Texas, New Mexico, and Pennsylvania.

Frank Cooter, southwestern exploration manager for Cities Service Oil Co., has been transferred from Midland, Tex., to Santa Fe, N. M., where he will be special company representative. **E. J. Gemmill,** assistant southwestern exploration manager, moves up to manager succeeding Cooter. Cooter will handle company business with state and federal agencies in Santa Fe.

George F. Hornaday, associate manager of Houdry Process Corp.'s research and development division, has moved up to manager. As associate manager, Hornaday has headed operations at Houdry's Linwood, Pa., laboratories. He was with Socony Mobil Oil Co., Inc., before joining Houdry in 1940 as assistant manager of development.

Delano B. McGowen has been promoted from trainee engineer for Sohio Petroleum Co. in Oklahoma City to junior engineer in Centralia, Ill.

Lloyd L. Sullins has been promoted by Amerada Petroleum Corp. from foreman in Tioga, N. D., to assistant production and drilling superintendent in Seminole, Okla.

DEATHS

Henry L. McEvoy, 57, producer and drilling contractor, died at his home in Bay City, Mich., recently after a long illness.

Earl Tiffany, 77, retired drilling contractor, died recently in Tulsa. Tiffany was one of the organizers of Tiffany Brothers Drilling Co. in Tulsa in 1914. He retired in 1948.

David McCulloch, 80, retired board chairman of Foster Wheeler Corp, died March 5 in Stamford, Conn. McCulloch was general manager, executive vice president, vice chairman, and chairman during his 50 years with Foster Wheeler. He retired in 1956.

Joseph E. Holm, 67, retired manager of Atlantic Refining Co.'s Oklahoma-Kansas region, died March 7 in Tulsa. Holm retired in 1956 after 45 years with Atlantic.

Wendell Zerbe Miller, 65, Tulsa independent operator and consulting geologist, died March 11 in a Tulsa hospital. Miller had been a consultant since 1926. He was with Gulf Oil Corp. before that time.

Harold C. Starkey, Houston independent, died March 5 in a Houston hospital. He was 64.

Robert Paul Ingram, 71, who retired as general superintendent of export terminals for Warren Petroleum Corp. in 1946, died March 7 in Tulsa after a heart attack. Ingram was with the old Indian Refining Co. and Phoenix Refining Co. before joining Warren.

Charles Saunders, 76, president of Saunders Brothers Well Drilling Co. and Oil Well Tools Co., died recently in Whittier, Calif.

Newell E. Loomis, 72, consultant to the president of Michigan Consolidated Gas Co., died March 4 in Ann Arbor, Mich.

M. D. Self, veteran West Texas independent operator, died March 7 at Midland, Tex. Self opened Magnolia Petroleum Co.'s West Texas office at Midland in 1934 and left the company to become an independent in 1944.

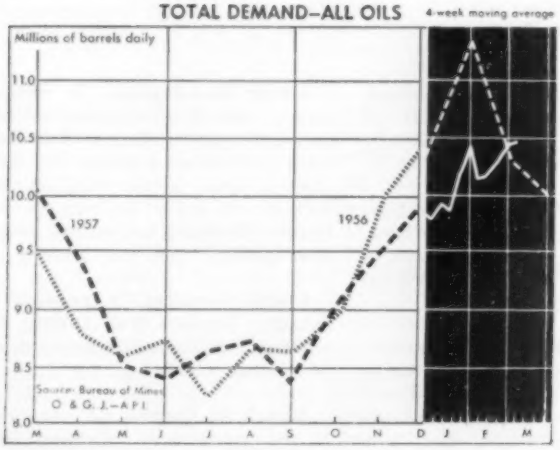
John W. Emch, 59, San Angelo, Tex., geologist, died March 9. Emch, in partnership with Jack Hagan, was active in some of West Texas' most famous oil pools, including Yates, Big Lake, Barnhart, and Benedum fields.

Stanley C. Herold, 74, retired geological consultant, died recently in Glendale, Calif.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,319,300	DOWN	528,025	DOWN	1,419,391
Crude stocks	287,995,000	UP	1,507,000	UP	34,339,000
Completions	877	UP	80	DOWN	9
Refinery runs	7,488,000	DOWN	72,000	DOWN	588,000
Gasoline stocks	215,409,000	UP	218,000	UP	9,627,000
Kerosine stocks	17,622,000	UP	455,000	DOWN	3,089,000
Distillate stocks	84,018,000	DOWN	4,620,000	UP	687,000
Residual stocks	54,803,000	UP	595,000	UP	18,420,000
Four-product stocks	371,852,000	DOWN	3,352,000	UP	25,645,000
Total imports	1,753,900	UP	41,500	UP	436,000



Distillate demand is good, but prices sag

BARGE PRICES for No. 2 fuel in New York Harbor are at the lowest point since 1954. Esso Standard Oil Co. reduced light-fuel prices 0.5 cent a gallon in most of its territory, effective March 12. In the New York Harbor area, the cut amounted to a net of 0.3 cent.

Esso had increased its voluntary allowance in New York Harbor to 0.4 cent a gallon on March 6 which gave a net price of 9.45 cents for barge delivery of No. 2 fuel. In the latest adjustment, Esso cut its posted price for No. 2 by 0.45 cent and at the same time reduced its voluntary allowance from 0.4 cent a gallon to 0.25 cent. These shifts left barge No. 2 at 9.15 cents a gallon. The new price for kerosine is 9.65 cents.

Here is a comparison of the new price with lows of recent years. The last time No. 2 fuel in New York Harbor dropped below 9.0 cents a gallon was in 1954. That year started out with No. 2 selling for 9.2 cents a gallon. The first decrease of the year came early in May bringing the price down to 8.95 cents. A series of small cuts reduced postings to 8.70 cents a gallon at the end of June. The price started back up in August and had reached 9.35 cents a gallon by the first week of October. Postings have dropped below that level only once since that time. No. 2 sold for 9.3 cents from the first of May to the middle of August in 1955.

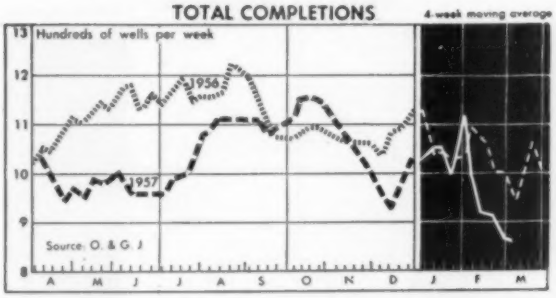
After August 1955, the No. 2 price remained above 10.00 cents a gallon until reductions started after the first of this year.

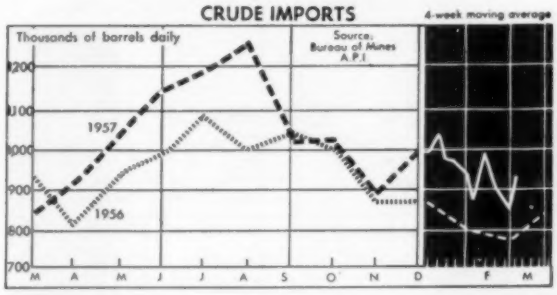
Sagging distillate prices on the East Coast are influencing cargo prices on the Gulf Coast. Market reports from that area indicate that distillate prices have softened slightly over the past few days.

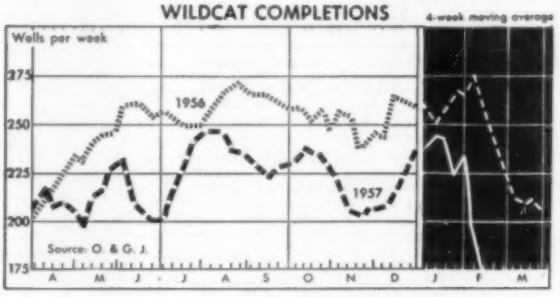
The full influence of inventories on distillate prices will not show up in a comparison of current stocks with those at this time last year. Gulf-East Coast distillate stocks show a gain of less than a million barrels over last year, but the 1957 stock level was too high.

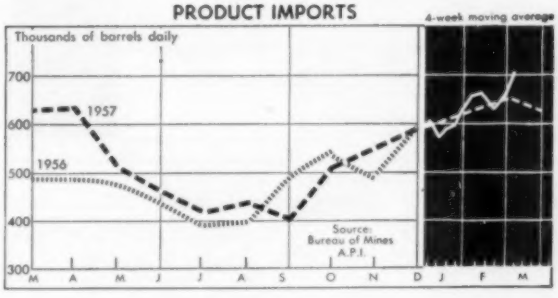
The distillate-stock total for these districts at the end of February 1957 was about 7,500,000 bbl. higher than it was for the same date in 1956. This gain came on top of an increase of 2,600,000 bbl. between 1955 and 1956. The distillate surplus may not be large, but at this time of the year even small excesses may produce market changes.

A few refiners on the Gulf Coast need to move some gasoline. The refiner's willingness to sell at low prices to cut his gasoline stocks is tending to soften the Gulf Coast gasoline market.







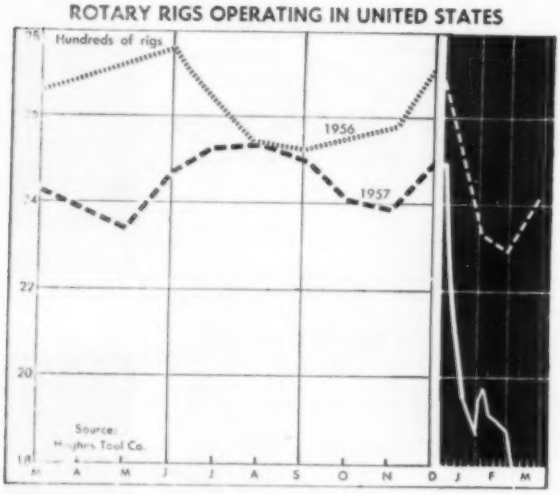


WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 8, 1958

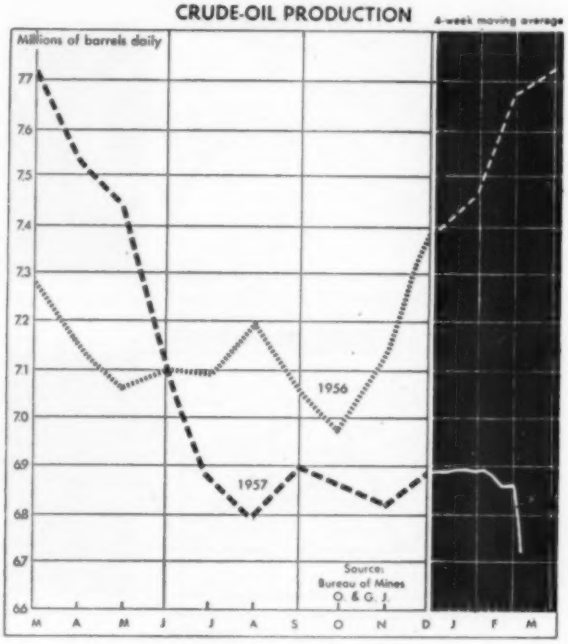
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	0	0	0	0	0	0	0	12	14	0	0	0	0	0	5	5
Arkansas	12	6	0	0	6	0	36,919	135	206	2	0	0	0	2	27	30
California	22	15	0	0	7	0	130,926	405	395	3	0	0	0	3	69	107
Colorado	10	3	0	0	7	0	58,487	141	217	4	1	0	0	3	77	144
Illinois	33	14	0	0	19	0	79,190	384	462	8	0	0	0	8	71	107
Indiana	17	5	0	1	11	0	26,667	139	122	7	1	0	0	6	48	22
Kansas	83	42	1	3	36	1	289,991	759	801	15	2	0	0	13	157	142
Kentucky	15	3	0	1	11	0	16,787	161	278	4	1	0	0	3	21	62
Louisiana	67	42	7	1	17	0	500,099	623	709	7	3	1	0	3	76	123
North	30	23	0	0	7	0	98,610	220	276	4	2	0	0	2	31	35
South	29	14	7	1	7	0	332,175	318	315	3	1	1	0	1	42	74
Offshore	8	5	0	0	3	0	69,314	85	118	0	0	0	0	0	3	14
Michigan	6	1	0	0	5	0	17,025	59	78	4	0	0	0	4	23	32
Mississippi	6	0	1	0	5	0	49,759	78	60	2	0	0	0	2	43	29
Montana	3	1	0	1	1	0	22,291	81	58	1	0	0	1	0	40	21
Nebraska	13	2	0	0	11	0	75,146	134	145	8	0	0	0	8	68	82
New Mexico	42	31	0	7	4	0	182,392	433	385	4	1	0	0	3	67	60
West	20	12	0	6	2	0	82,776	216	146	2	1	0	0	1	34	23
East	22	19	0	1	2	0	99,616	217	239	2	0	0	0	2	33	37
New York	14	5	0	0	4	5	27,462	101	....	4	0	0	0	4	9	....
North Dakota	13	10	0	0	3	0	90,085	83	65	6	3	0	0	3	31	26
Ohio	15	7	0	5	3	0	47,611	171	191	0	0	0	0	0	3	3
Oklahoma	137	72	3	8	50	5	435,973	1,407	1,313	11	1	0	0	10	194	151
Pennsylvania	0	0	0	0	0	0	0	16	*59	0	0	0	0	0	1	*20
Texas	325	179	12	11	117	6	1,385,891	3,582	4,205	66	8	1	0	57	767	1,195
Dist. 1	16	11	0	1	4	0	32,953	181	211	2	0	0	0	2	71	86
Dist. 2	10	5	1	0	4	0	69,802	110	140	4	3	0	0	1	30	65
Dist. 3	22	10	3	1	8	0	158,105	239	369	5	0	0	0	5	41	124
Dist. 4	16	3	2	2	9	0	90,162	221	271	5	0	1	0	4	74	105
East	17	6	1	0	10	0	65,419	262	244	4	0	0	0	4	76	74
Dist. 7-B	44	21	0	1	21	1	94,413	440	566	8	0	0	0	8	139	213
West	97	65	1	1	26	4	529,466	1,085	1,130	18	3	0	0	15	166	190
Dist. 9	81	46	0	3	31	1	239,126	780	987	18	2	0	0	16	146	312
Dist. 10	22	12	4	2	4	0	106,445	264	287	2	0	0	0	2	24	26
Utah	5	4	0	0	1	0	28,712	84	25	0	0	0	0	0	14	13
West Virginia	6	1	0	3	2	0	13,784	141	132	1	0	0	0	1	5	9
Wyoming	29	10	0	1	18	0	129,458	160	154	8	0	0	0	8	63	59
Misc. (Tenn., Wash.)	4	0	0	0	4	0	7,951	27	17	3	0	0	0	3	21	11
Total U. S.	877	453	24	42	342	16	3,652,606	9,316	10,091	168	21	2	1	144	1,900	2,453
Total prev. week	797	404	17	52	308	16	3,388,263	.....	.....	149	16	0	5	128	.....	.....
Cum. 1958	9,316	4,682	218	673	3,556	187	39,389,897	.....	.....	1,900	178	24	71	1,627	.....	.....
Western Canada	54	22	0	3	29	0	260,897	452	466	26	0	0	1	25	154	123

*Includes New York.

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL PRODUCTION



ACTIVE ROTARY RIGS*

	3-10-58	3-3-58	2-24-58	3-11-57
Alabama	6	6	7	14
Arkansas	20	20	22	18
Arizona	1	1	1	....
California	84	85	85	97
Colorado	22	29	26	42
Florida	2	2	2	2
Georgia	....	....	....	....
Idaho	....	....	....	....
Illinois	18	39	47	46
Indiana	1	1	7	3
Iowa	....	3	3	1
Kansas	84	100	117	169
Kentucky	3	3	4	7
Louisiana	314	324	327	442
North	22	30	30	55
South	231	234	231	276
Offshore	61	60	66	111
Maryland	....	....	....	1
Michigan	8	7	9	12
Missouri	....	....	....	....
Montana	22	25	26	27
Mississippi	36	43	40	21
Nebraska	19	22	19	31
Nevada	....	....	....	....
New Mexico	100	106	109	113
New York	1	1	1	1
North Dakota	34	32	29	27
Ohio	....	1	1	....
Oklahoma	183	187	182	239
Oregon	....	....	....	1
Pennsylvania	12	10	10	11
South Dakota	....	....	....	3
Texas	738	733	727	1,028
Gulf Coast	153	142	153	226
Offshore	2	....	2	8
West	309	308	305	400
North	233	244	223	338
East	41	39	44	56
Tennessee	....	....	....	....
Utah	42	42	42	34
Washington	1	....	....	1
West Virginia	4	4	4	....
Wyoming	42	43	50	52
Virginia	....	....	....	....
Total United States	1,797	1,869	1,897	2,443
Western Canada	216	240	237	250
Eastern Canada	....	....	....	....
Grand total	2,013	2,109	2,134	2,693

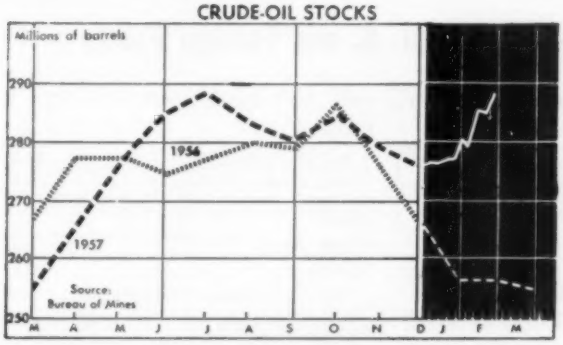
*Hughes Tool Co.

DAILY AVERAGE PRODUCTION FOR WEEK

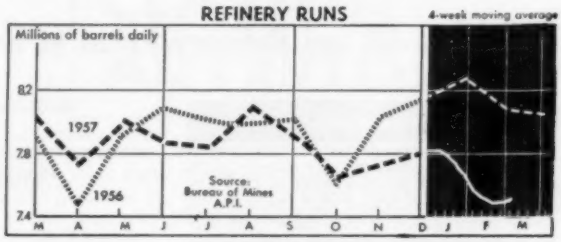
	March 8, 1958			Mar. 1
	Crude oil	Lease condensate	Total	total
Alabama	15,925	.....	15,925	15,950
Arkansas	83,000	200	83,200	83,000
California	886,400	.....	886,400	889,300
Colorado	140,350	.....	140,350	141,500
Eastern	48,000	.....	48,000	48,900
Florida	1,275	.....	1,275	1,275
Illinois	231,200	.....	231,200	228,300
Indiana	30,700	.....	30,700	30,500
Kansas	†256,925	.....	†256,925	†332,400
Kentucky	40,300	.....	40,300	40,500
Louisiana	729,625	89,300	818,925	857,700
North	111,875	2,800	114,675	114,600
South	617,750	86,500	704,250	743,100
Michigan	24,300	.....	24,300	25,200
Mississippi	99,400	4,975	104,375	103,850
Montana	75,000	.....	75,000	74,350
Nebraska	54,650	.....	54,650	52,800
Nevada	150	.....	150	150
New Mexico	258,275	6,600	264,875	266,050
North Dakota	35,300	.....	35,300	38,100
Oklahoma	†579,400	.....	†579,400	†570,400
Texas	2,238,000	63,850	2,301,850	2,722,150
Dist. 1	44,000	500	44,500	48,475
Dist. 2	93,000	9,300	102,300	131,125
Dist. 3	327,000	32,000	359,000	402,000
Dist. 4	161,000	7,400	168,400	206,500
Dist. 5	28,000	400	28,400	35,500
Dist. 6	100,000	7,400	107,400	129,000
East Texas Field	125,000	.....	125,000	164,000
Dist. 7-B	132,000	150	132,150	148,150
Dist. 7-C	115,000	3,650	118,650	146,650
Dist. 8	816,000	1,500	817,500	1,001,500
Dist. 9	190,000	900	190,900	201,600
Dist. 10	107,000	650	107,650	107,650
Utah	17,150	.....	17,150	16,200
Wyoming	308,850	.....	308,850	308,550
Others	‡200	.....	‡200	‡200
Total U. S.	6,154,375	164,925	6,319,300	6,847,325
Change from previous week, down			528,025	
Canada	†479,300	.....	†479,300	†520,200
Total U. S. production—Jan. 1-March 8				456,459,690 bbl.
Same period last year (crude plus cond.)				*508,351,524 bbl.

*Includes 9,784,850 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

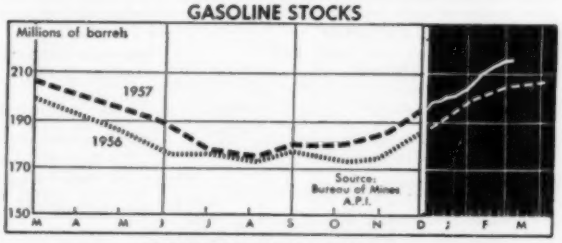
CRUDE-OIL STOCKS



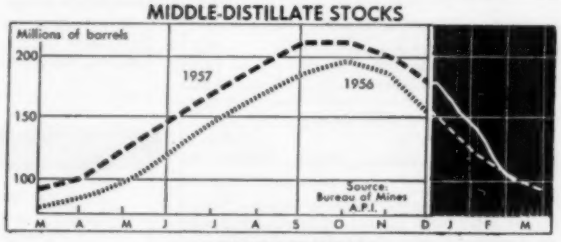
REFINERY RUNS



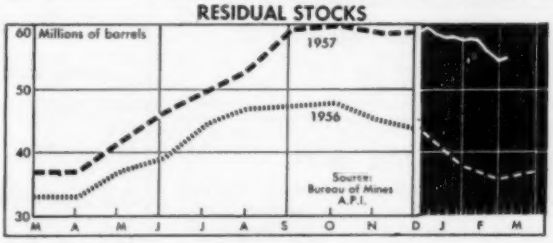
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	3-1-58	2-22-58	3-2-57
Pennsylvania Grade	2,807	2,803	2,442
Other Appalachian	1,483	1,627	2,008
Illinois, Indiana, and Michigan	10,589	10,957	10,092
Nebraska and North Dakota	2,634	2,608	1,888
Kansas	9,799	9,409	9,234
Oklahoma	18,070	‡18,806	21,399
Arkansas	3,037	3,056	2,296
Louisiana	20,356	20,187	20,517
North	3,313	3,306	2,802
South	17,043	16,881	17,715
Mississippi, Ala., and Fla.	2,638	2,892	2,014
New Mexico	8,311	‡8,334	7,135
Texas	130,005	‡128,351	114,854
East Texas	9,040	9,202	10,305
West Texas	57,255	‡56,915	53,908
Texas Gulf	27,457	‡26,364	21,806
Other Texas	36,253	‡35,870	28,835
Wyoming	15,487	‡14,947	15,934
Other Rocky Mountain	7,076	6,926	5,639
California	38,961	38,639	27,638
Foreign	†16,742	16,946	10,566
Total	287,995	‡286,488	253,656

*Bureau of Mines. †Includes 5,338,000 bbl. in California. ‡Revised.

API REFINERY REPORT, MARCH 7, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1957 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,104	476.6	32.3	320.3	213.0	43,410	7,539	26,794	9,841	1,229	504.4	44.7	323.2	219.3
Appalachian:														
District 1	84	36.1	4.4	20.7	9.3	5,314	465	1,765	583	104	40.1	4.6	24.6	9.6
District 2	112	49.4	15.6	25.6	11.4	2,800	270	628	463	109	54.2	7.6	19.0	14.6
Ind., Ill., Ky.	1,386	646.0	89.7	327.9	171.4	39,555	3,492	11,295	4,152	1,400	684.8	71.6	283.2	184.8
Minn., Wis., Dak.	109	49.9	9.3	26.9	13.9	7,060	579	3,890	426	103	48.6	6.5	24.7	7.9
Okla., Kans., Mo.	711	373.3	11.0	194.4	27.4	21,163	663	6,607	963	683	368.7	16.3	156.1	35.2
Inland Texas	266	192.6	7.2	53.7	24.0	9,328	302	1,373	2,083	270	207.0	8.8	53.7	21.6
Texas Gulf Coast	1,702	796.0	146.4	455.1	216.7	31,381	1,568	8,941	4,973	1,953	861.7	106.4	532.2	237.7
La. Gulf Coast	616	325.0	81.7	113.6	57.3	13,038	1,241	4,931	1,199	666	301.8	51.1	183.2	48.5
N. La. and Ark.	94	30.3	7.0	18.1	7.9	5,159	848	1,665	114	93	35.0	6.3	23.1	6.7
Rocky Mountain:														
New Mexico	28	14.4	1.0	6.7	3.7	383	19	124	88	26	14.0	0.5	4.8	3.3
Other Rocky Mtn.	253	122.8	4.7	59.1	36.6	8,034	296	2,673	896	267	126.6	2.4	68.6	33.2
West Coast	1,023	498.0	3.4	111.6	350.4	28,784	340	13,332	29,022	1,144	496.2	5.7	164.2	382.5
Mar. 7, 1958	7,488	3,613.4	413.7	1,733.7	1,143.0	215,409	17,622	84,018	54,803	8,047	3,743.1	332.5	1,860.6	1,204.9
Feb. 28, 1958	7,560	¶3,775.6	396.4	1,736.4	1,074.3	215,191	17,167	88,638	54,208	.....	.....	.....	.....	.....
Mar. 8, 1957	8,076	3,809.6	347.3	1,904.0	1,225.4	205,782	20,711	83,331	36,383	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. ¶Revised.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.25-11.75
Premium (98 octane)	14.00-14.50
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	9.75-10.25
★ Regular (92 octane)	10.00-10.50
★ Premium (97 octane)	11.50-12.00
★ Premium (98 octane)	11.75-12.50
California (rack) (Los Angeles):	
★ Regular (88 octane)	12.0
Premium (96 octane)	14.5
Premium (98 octane)	15.0
Caribbean area (cargoes):	
★ Regular (87 octane)	9.625-9.875
★ Premium (93 octane)	10.50-10.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.125-9.50
Distillate No. 1	9.125-9.50
Distillate No. 2	8.50-8.75
Gulf Coast (cargoes):	
Kerosine 41-43	8.50-8.75
★ Distillate No. 2	8.125-8.375
New York Harbor (barges):	
★ Kerosine 41-43	9.65
★ Distillate No. 2	9.15
★ Diesel fuel, 48-52 d.i.	9.75
Caribbean area (cargoes):	
★ Distillate No. 2	8.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.20-1.30
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.25-2.40
New York Harbor (barges):	
Bunker C fuel	$2.65
Caribbean (cargoes):	
★ Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.65-2.80

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	26
200 vis. neutral (180° at 100°), 25 p.t.	24

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) (§)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Some heavy Wyoming sour posted at 8 cents less.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, Feb. 3, 1958.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.40
Middle District	4.22
Southwest Pennsylvania	3.93
West Virginia	3.75
Buckeye Grade	3.75
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25-2.38
Bachaquero, flat, Las Piedras*	2.03-2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—25%)	$2.14
★ Carib.-U.S.N.H., dirty (USMC—60%)	1.08
★ P.G.-Japan, clean (USMC—20%)	8.16

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COUPLINGS—6" used—A.P.I. Line Pipe Couplings. State Condition, Quantity, Price. Box K-523, The Oil and Gas Journal, Tulsa, Oklahoma.

WANT TO BUY PIPE in the ground anywhere. From 6" Dia. up. Box K-572, The Oil and Gas Journal, Tulsa, Oklahoma.

SMALL BLOWOUT PREVENTER. Small Drill Collars. R. B. Beckman, c/o Hudson Hotel, Oklahoma City, Oklahoma.

WANTED TO BUY—One 8 inch power pipe straightening machine—Redneb Pipe Company—Shreveport, Louisiana—P. O. Box 1798.

12-900 HYDRIL TYPE "GK" Blowout Preventer and Accumulator. Advise condition and bottom cash price on either or both. Box K-566, The Oil and Gas Journal, Tulsa, Oklahoma.

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FOR SALE in Kansas and Oklahoma, 15—10' x 40' horizontal steel gasolene storage tanks riveted and welded type. Complete data upon request. Cities Service Oil Company—Patridge—Bartlesville, Oklahoma.

36-L BUCYRUS SPUDDER on skids or trailer mounted. Near Chicago. Excellent condition. Butane and gas. Phone 498-J, J. M. Berry, Skiatook, Oklahoma.

2 COMPLETE DRILL STEM Testing Units, practically new, combination tools, two trucks, one car. Contact—Paul Hieronymus, Telephone 3014, Stillwater, Oklahoma.

MAYHEW SHOT HOLE Drill and Drill Tender. Good condition. Sacrifice. Tom Purcell, 2220 Adolphus Tower, Dallas, Texas. RI 2-4257.

SERVICE COMPANY EQUIPMENT—Wichtex C-60 and C-65 double drum mounted units, three pickup trucks, light plant and complete tools $25,000.00. May be inspected in operation. Novice, Texas, Phone 363, or Fort Worth, ED 6-3788.

1 GMC PERFORATING TRUCK, complete with Gamma Ray logging equipment. 20,000' line capacity. Perfect condition. Will sell with or without logging equipment and line. Box K-487, The Oil and Gas Journal, Tulsa, Oklahoma.

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16" O.D. PIPE
25,000 FEET
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Machine cleaned plain ends.
Used. Good condition.
Complete inventory pipe
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SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

1956 FAILING 1500 truck mounted. 5x6 G-D pump, 38' mast, pipe and auxiliary equipment. Also 1955 I-R 600 Gyroflo compressor, truck mounted. Richard Travis, 615 North First, Phone CHapel 2-8331, Grand Junction, Colorado.

2—170 H.P. COOPER-BESSEMER TYPE 80 GAS ENGINE COMPRESSORS

Serial Nos. 4808 and 4809. 200 RPM, equipped with 7¾" x 20" compressor cylinders. Good condition, now in operation. Will be available July 1st.

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1—140'x40'x8'9" Deck Cargo & Oil Well Testing Barge. 1150 Tons—6,500 Barrels.
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Cable Address—Branbarco

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CLARK MODEL HMA-4 gas engine driven skid mounted (packaged) compressor with 175 HP, two stage, 3¼" and 2⅝" by 8¼" compressor cylinders, 400 PSI suction, 2900 PSI discharge, 59,000 SCFH, unused, contact Demse, Lowell Gas Co., Lowell, Mass.

COMPLETE ROTARY RIGS

two to ten thousand feet. Terms available. Will lease with option to purchase. For price and location contact

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604 Petroleum Building
Wichita, Kansas

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4½"	F-25, 9.5# LW	52,000'
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5,000 bbl. Cone (3)	2,500 bbl. Cone
1,800 bbl. Cone (2)	1,800 bbl. Cone (12)
1,500 bbl. Cone (2)	1,500 bbl. Cone (2)
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PETROLEUM CHEMIST — Mid-Continent area refinery has immediate opening for Petroleum Chemist with degree and experience in analysis of petroleum products. Send resume and salary requirements. Box K-603, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT—Independent Oil Operator located in Illinois needs an accountant familiar with all aspects of an operating company. In reply give summary of education, experience, salary expected and date available. Write Athene Development Co., Inc., P. O. Box 54, Champaign, Illinois.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

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PETROLEUM ENGINEER. Expanding Independent Company has immediate opening for Petroleum Engineer to take over secondary recovery operations. Must be experienced and capable of assuming full responsibility for lay-out of well system, plant design, drilling and completion of wells and operation of water flood. Must have a practical approach to problems based on actual experience. Location Southwest. Arrangements will be made for interview. Box K-592, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

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ECONOMIC ANALYST—Twelve years experience refinery operations integrated major. Desires comptrollership or equivalent responsible position progressive company. Supervisory experience. Business Management and Engineering Degrees. Box K-601, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, presently employed, five years experience exploration and evaluation. Desires connection with independent or company. Box K-599, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - STRATIGRAPHER, twenty years experience Oklahoma, Texas, San Juan Basin. Geological Administrative Experience. Box K-596, The Oil and Gas Journal, Tulsa, Oklahoma.

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NOTICE OF SALE BY TRUSTEE IN DISSOLUTION OF CORPORATION OF PRODUCING ROYALTY INTERESTS IN CADDO COUNTY, OKLAHOMA.

NOTICE IS HEREBY GIVEN that on the 4th day of April, 1958, at the hour of 2:00 o'clock P.M., in the foyer of the Court House in the City of Alva, Woods County, Oklahoma, the undersigned will sell to the highest and best bidder for cash, subject to confirmation of the District Court of Woods County, Oklahoma, all of the right, title and interest of the Enid Drilling Company, dissolved, in and to the following mineral interests under the real estate described, which are now producing oil:

1. An Undivided 4/40ths mineral interest in and under the Northwest Quarter (NW¼) of the Southwest Quarter (SW¼) of Section Four (4), Township Five (5) North, Range Nine (9), W.I.M., Caddo County, Oklahoma.
2. An undivided 4/100ths mineral interest in and under the west Half (W½) of the Southeast Quarter (SE¼), and the West Half (W½) of the Southeast Quarter (SE¼) of the Southeast Quarter (SE¼), of Section Four (4), Township Five (5) North, Range Nine (9), W.I.M., Caddo County, Oklahoma.

The foregoing interests were adjudicated as being owned by said corporation by judgment in the case of W. L. Thatcher vs. Matie B. Glasgow, et al., No. 16,828, District Court of Caddo County, Oklahoma, on March 12th, 1954, and sale of such mineral interests is being made by the undersigned Trustee pursuant to Order of the District Court of Woods County, Oklahoma, entered January 15th, 1958, in The Matter of the Dissolution of the Enid Drilling Company, a Corporation, No. 10,748.

DATED February 19th, 1958.

JOHN B. DOOLIN, TRUSTEE

Office: Alva State Bank Building
Alva, Oklahoma.

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The Oil and Gas Journal's

1957 ANNUAL EDITORIAL INDEX

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ADVERTISERS in this issue

A

ACF Industries, Incorporated, Valve Division 32, 33
Aero Service Corporation 158
Albuquerque National Bank 236
Allis-Chalmers—
Industrial Equipment Division 24
Alten Foundry & Machine Works, Inc. 236
Aluminum Co. of America 225
American Chain & Cable—
Hazard Wire Rope Division 30
R-P&C Valve Division 31
American Iron & Machine Works Co. 36
Anchor Petroleum Company 76
Armco Drainage & Metal Products, Inc. 23
Armstrong Machine Works 22
Associated Business Publications 154

B

B and W Inc. 193
Babcock & Wilcox Company—
Tubular Products Division, The 72
Baker Oil Tools, Inc. 74
Baroid Division, National Lead Co. 134
Beech Aircraft Corporation 121
Bethlehem Supply Company 95
Black, Sivalls & Bryson, Inc. 13
Bradford Motor Works 234
BrakeSol, Inc. 66
Braniff International Airways 188

C

Cardwell Mfg. Co., Inc. 54, 55
Caterpillar Tractor Co. 174, 175
Century Electric Company 53
Chiksan Company 43
Christensen Diamond Products 215
Classified Advertising 263, 264, 265, 266
Coates Field Service, Inc. 196
Columbus Hotel, The 243
Consolidated Electrodynamics 63
Construction Machinery Company 203
Continental-Emsco Company 208 through 213
Continental Oil Company 46
Corrosion Services Incorporated 195
Crane Co. 92
Crose Manufacturing Co., Inc., M. J. 200
Curtiss-Wright Corporation 16

D

Darling Valve & Mfg. Co. 197
Dowell Incorporated 228, 229
Drilling & Service, Inc. 253
Drilltrol 166
du Pont 37, 38

E

Eastman Oil Well Survey Company 157
Electro-Motive Division General Motors 40, 41
Electro Rust-Proofing Corporation 238

F

Fairbanks, Morse & Co. 4
First National Bank of Shreveport, The 148
First National Bank & Trust Co. of Tulsa, The 57
Fleet-Line Co. 194
Fort Worth National Bank, The 61

G

Gardner-Denver Company 25
Gaso Pump & Burner Mfg. Co. 219
General American Transportation Corporation 42
General Welding Works 193
Geolograph Mechanical Well Logging Service 148
Geophysical Service, Inc. 125
Goodyear Tire & Rubber Company, The 7
Government of Alberta Department of Economic Affairs 241
Grancell, I. H. 192
Guiberson Corporation 39

H

Halliburton Oil Well Cementing Co. 8, 9, 247
Harrisburg Sales & Service, Inc. 198
Hawthorne, Inc., Herb J. 168
Haynes Mfg. Co. 169
Hazard Wire Rope Division of American Chain & Cable Co., Inc. 30
Houston Export Crating and Construction Company, Inc. 66
Huey & Co., S. E. 194
Hughes Tool Co. Back Cover
Humble Oil & Refining Co. 26
Hyatt Bearings Division, General Motors Corp. 14

I

International Nickel Company, Inc. 48
Iverson Supply Company 155

J

Jensen Bros. Mfg. Co., Inc. 246
Jones & Laughlin Supply Division 250, 251

K

Keeprite Eastern Inc. 199
Klaus Exploration Co. 240
Kobe 249
Koenig Iron Works, Inc. 169

L

Lane-Wells Company Inside Front Cover
Larkin and Company, Inc. 170
Larkin Packer Company, Inc. 231
Layne & Bowler, Inc. 15
LeGrand Rochester Limited 221
Love Box Company, The 172
Lufkin Foundry & Machine Co. 27

M

Macco Oil Tool Co. 204
Mack Trucks, Inc. 171
Macwhyte Co. 1
Magnet Cove Barium Corp. 205
Manhattan Rubber Division, Raybestos-Manhattan, Inc. 64, 65
Manning, Maxwell & Moore, Inc. 68, 69
Martin, Manufacturer, John N. 11
Masoner's, Inc. 169
Master Tank & Welding 204
Mayo Hotel, The 236
McCollum & Co., E. V. 173
Mid-Continent Supply Company 185, 186, 187
Miller Sand Pump Co. 192
Mission Mfg. Company 71
Moore Corporation, Lee C. 146
Morse Chain Company 34
Mountain Iron and Supply Company 223

N

National Aluminate Corp. 91
National Tank Company 268
Neese Exploration Company 148
Newport News Shipbuilding and Dry Dock Company 52

O

Oil Center Tool Co. 142
Oil States Rubber Co. 57
Oil Well Supply Division 6
Otis Engineering Corporation 206

P

Parkersburg Rig & Reel Co. 137
Partlow Corp., The 56
Penn Controls, Inc. 60
Perforating Guns Atlas Corporation 161
Pittsburgh Steel Company 44, 45

R

Raybestos-Manhattan, Inc.—
Manhattan Rubber Division 64, 65
Packing Division 214
Reading & Bates Offshore Drilling Co. 248
Rector Well Equipment Co., Inc. 12
Reed Roller Bit Company 58, 59
Republic Exploration Company 153
Republic National Bank of Dallas 243
Reynolds Metals Company 50, 51
Rogers Geophysical Company 133
Rolatape, Inc. 243
Ross-Martin Co. 193
Royal Bank of Canada, The 10
R-P&C Valve Division American Chain & Cable 31

S

Schlumberger Well Surveying Corp. 167
Security Engineering Division 151
Seismic Engineering Company 165
Seismograph Service Corp. 138
Servco 17
Sheffield Division, Armco Steel Corporation 18
Southern Mill & Mfg. Co. 196
Southwestern Industrial Electronics Co. 140, 141
Spang & Co. 242
Square D Company 47
Stine Incorporated, Joe 237
Stoody Co. 252
Strahman Valves, Inc. 217
Sunshine Iron Works 217

T

Technical Oil Tool Corporation 145
Tex-Tube Inc. 239
Thompson Pump Company 66
Thompson Tool Co. 224
Thornhill-Craver Co. 28
Tidelands Exploration Co. 131
Timken Roller Bearing Company 35
Toronto-Dominion Bank, The 147

U

United States Borax & Chemical Corporation Pacific Coast Borax Division 67
United States Steel Corporation—
Oil Well Supply Division 6
Universal Atlas Cement Co. 216

W

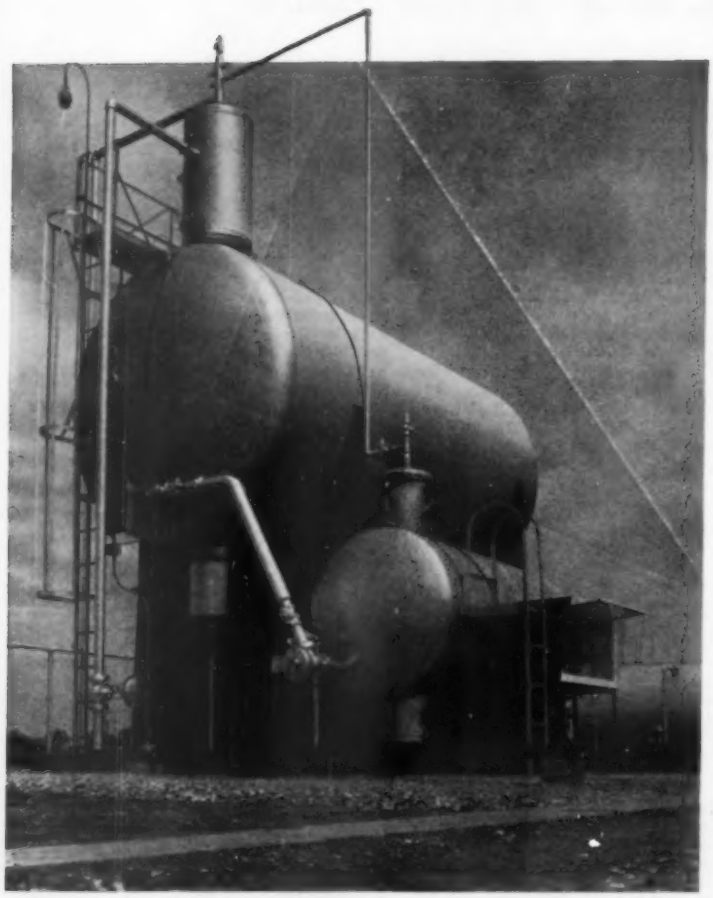
Walker Co., W. L. 194
Wallace & Tiernan, Inc. 238
Waukesha Sales & Service, Inc. 20, 21
Welex, Inc. 62
Well Equipment Mfg. Corp. 19
Western Company, The 29
Western Geophysical Company of America 152
Wheland Company, The 49
White Diesel Engine Division, The White Motor Company 5
Williams Brothers 218
Williamson, Inc., T. D. 70
Wilson Manufacturing Co., Inc. 226
W-K-M Manufacturing Company, Inc., A Subsidiary of ACF Industries, Incorporated 32, 33
World-Wide Instruments, Inc. 150
Worth Well Surveys 164

Y

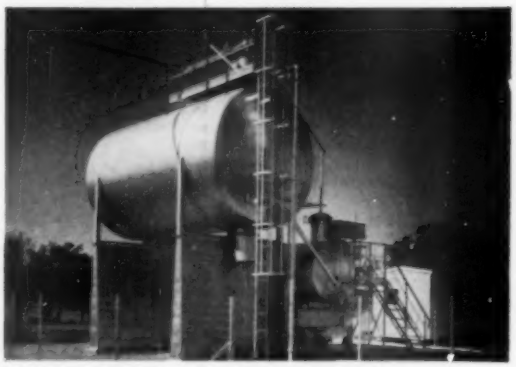
Youngstown Sheet and Tube Company Inside Back Cover

TRANS-OIL* units cut costs

Automatic Transfer of Crude Oil from treated storage to Pipeline



Texas Gulf Coast — 60 barrel metering tank with 400 barrel storage tank; storage tank has an oil and gas separator mounted on its inlet and is equipped with level diverting valves and hi-lo shut down controls.



Southern Oklahoma — 60 barrel metering tank with 444 barrel storage tank; in operation since March of 1956; delivering oil to the pipeline on an automatic basis since November of 1956.

Wyoming — Tandem system comprising 2-100 barrel metering tanks providing continuous delivery to the pipeline. The system uses lease storage tanks as volume storage ahead of the Trans-Oil metering tanks.

National's packaged LACT unit assures fool-proof, dependable, economical, continuous operation.

- Fully automatic measuring and delivery to the pipeline.
- Pipeline run can be continuous or scheduled as required.
- Simple design and construction mean minimum maintenance.
- All valves and controls are fail-safe.
- More accurate, cleaner lease operation.
- Operates pneumatically, electrically or in combination as lease facilities dictate.
- Lease labor can be used for more productive duties.
- Reduces office accounting costs to producer and purchaser by measuring Net Barrels instead of Feet and Inches.

* TRANS-OIL is a trademark of National Tank Company.

It's a National®

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

Tubing stretch mill, Youngstown, Ohio. Electronically controlled mill to be completed during second quarter of 1958 . . . will provide increased production for Tubing comparable to our increased capacity for Casing. Both Upset Finishing Mill and this facility will greatly augment our existing No. 1 and No. 2 Seamless Mills in Youngstown. Photo shows mill building under construction.

NEW MILLS FOR BIGGER MARKETS

Two years ago, ground was broken for our three new seamless Pipe facilities. The express purpose of this massive expansion program was to make YOUNGSTOWN'S production capacity and seamless pipe product mix conform to the future needs of the Oil and Gas Industries. These seamless pipe facilities are now integrated with your demands. This means you can look to YOUNGSTOWN for a full line of Oil Country Tubular Goods without limitations as to size, grade or finish in Drill Pipe, Casing, Tubing and Line Pipe!

QUALITY YOUNGSTOWN SERVICE

YOUNGSTOWN

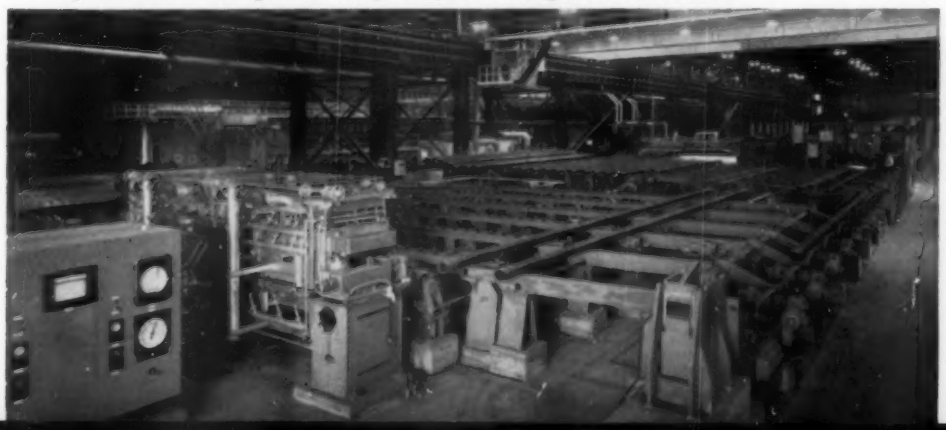
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steels

Youngstown, Ohio

No. 3 seamless mill, Indiana Harbor, Indiana. Fully automated, ultra modern mill . . . began operating September 30. Contains world's largest Rotary Billet Heating Furnace . . . adds to our over-all capacity in both alloy and carbon casing. Offers API casing in sizes 4½", 5", 5½" and 7", in grades H-40, J-55, N-80, in ranges 2 and 3 . . . plus line pipe in sizes 4½", 5⅝" and 6⅝" O.D. in grades A, B, X-42, A106, A53 in single and double random lengths. Photo shows Rotary Furnace in foreground.

Upset finishing mill, Youngstown, Ohio. Also a fully automated mill began operations September 15. Contains a pair of automatic upsetters with attendant furnaces plus a full-length normalizing furnace for highest quality control of all products. This mill adds to our capacity for Drill Pipe in grades D, E, x-95 and in Upset Casing (Speedtite). Photo shows upsetter and control panel in foreground, normalizing furnace in left rear.



Hughes sets rock bit standards the world over

HUGHES TOOL COMPANY